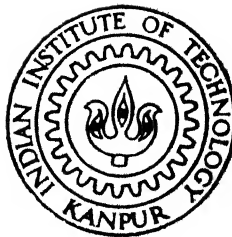


AN ORGANIZATIONAL STUDY OF INDIAN SOFTWARE FIRMS

By

MADHAV J. NEGI



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DEPARTMENT OF INDUSTRIAL AND MANAGEMENT ENGINEERING

INDIAN INSTITUTE OF TECHNOLOGY KANPUR

NOVEMBER 1996

AN ORGANIZATIONAL STUDY OF INDIAN SOFTWARE FIRMS

A Thesis Submitted
in Partial Fulfillment of the Requirements
for the Degree of

Master of Technology

BY

MADHAV J. NEGI

to the

DEPARTMENT OF INDUSTRIAL & MANAGEMENT
ENGINEERING

INDIAN INSTITUTE OF TECHNOLOGY, KANPUR
NOVEMBER 1996

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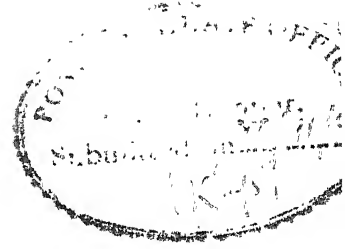
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It is certified that the work contained in the thesis entitled “ An Organizational Study of Indian Software Firms” by Madhav J. Negi has been carried out under my supervision and that this work has not been submitted elsewhere for a degree.

A handwritten signature in black ink, appearing to read "Rahul Varman".

(Rahul Varman)

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ABSTRACT

The Indian software industry is one of the best performing industries in India. The Fortune 500 companies prefer to outsource their software requirements to India. Despite such superlative performances, we have little global market share in software.

This is attributed to Indian software efforts being primarily of the software services type, generally involving coding services. There is a global trend towards software products and packages. A Department of Electronics committee recommends that developing Indian made software products and packages will enable the industry to meet targets for the next five year plan. We have well-developed organizations to provide software services. Changing to a software product based strategy will involve changes in the organization. This thesis attempts to formulate a way to transition from current orientations to the required product orientations through observing the organization different software firms. This kind of approach, focusing on the organizational attributes of a software company have not been found in the available literature. The meager literature available, has treated project or teams' organization, not company organization.

The broad research objectives aim to determine if we can understand and explain the management of a software service firm using the service literature. It also aimed to find how a product firm differed from a service firm in terms of organization. Not much is available on managing software companies. Most of the current business is of the kind called "professional consultancy" and "software services". Thus it was postulated that the service management literature would provide us with a means to understand the

organization in a service firm. We observed the product firms to gain an understanding of the organizational peculiarities for product development.

The study encompassed 7 companies in different cities in India. All of these companies are among the best in their sectors of Indian software industry. Half of these were service companies and half were product development companies. One company was into both businesses. The data was collected through non-scheduled, semi-structured interviews.

The findings of the study show that viewing the software services firm as a service business can indeed help understand and better manage it. It was found that software service firms do show characteristics of a service business. The product companies demonstrate a more stable and functionally oriented organization, particularly an independent, distinct testing group. It was found that a feedback process plays an important role in the development of the product. Product companies showed end-user domain expertise.

Following are some suggestions. Service companies can adopt the service strategies of focus on niches and employ continuous learning policies. This will enable them to gradually develop domain expertise by accumulating experience in the end-user segment. They should encourage the same team to stay in one end-user segment and let that team develop domain expertise and the peculiarities of software development in that domain. Service firms should arrange to encourage specialization in competencies like requirements' generation and testing.

Acknowledgment

This thesis sees the light of the day due to the patient guidance of Dr. Rahul Varman. His insightful probing, critical comments and sustained support enabled me to move from wispy ideas to a hard copy. I am extremely grateful and fortunate to have had him as my thesis supervisor in this journey. In the years to come, I aspire to his levels of commitment to quality coupled with a deep understanding and tolerance for human failings.

I am very grateful to the many executives at all the firms I visited. They encouraged me in my work and spared me valuable time from their busy schedules. I am very thankful to the gracious persons who arranged for my visits in these firms. I am indebted to Dr. Ashokan, Dr. Sadagopan, and the Krishnamurthy family for making me absolutely at home in a new town. Dr. & Mrs. SD Nigam, Prof. Nagendra & Anupam Kunwar provided me with touching hospitality. Without their help I would have been lost in their metropolis. Mr. and Mrs. GN Chourey greeted me with warmth, moreover, imparted a lot of wisdom and bestowed generous blessings, some which have come to pass. Through a most gracious hospitality, the above mentioned people made my study possible. To them I offer my humble thanks.

During my stay at IIT, the IME family has been an unending source of support, and friendship. Such company & experiences are cherished memories. I am grateful to my teachers for their constant support. They watch over the IME students like protective hens overseeing the brood. Their faith inspires one to greater deeds. Each one of Dr. AP Sinha, Dr. RK Ahuja, Dr. TP Bagchi, Dr. Kripa Shankar, Dr. AK Mittal, Dr. RRK

Sharma, Dr. Sadagopan and Dr. Varman are personalities with qualities to imbibe and achievements to emulate. The graciousness of IME's office staff always impressed me. I am thankful to them for taking care of the details. I am sure that the home-like office, our dear IME lab, will always have someone to look after the computers with equal or greater affection. May the music play undisturbed. The Halls of Residence of IIT-K provided with me with best fellowship one could have asked for. To my numerous friends in the halls, I am grateful for their warmth, knowledge and fun that their presence evoked. Their continued presence on-line makes sure that cyberspace will never be a lonely universe for me. Thanks to many of them who loudly wondered, when, if at all, was I completing?

I have been blessed with the loving embrace of two sets of parents during my stay at IIT. Words fail to express my gratitude and intensity of affection I feel for them. Dr. SK Mullick and Mrs. Uma Mullick, Dr. ASR Sai and Mrs. Jayanti Sai, have so generously lavished their love and affection. Confusion shall always prevail about which home I am talking about.

To those who make everything worthwhile : Dr. JG Negi and Mrs. Asha Negi who set standards to measure up to. Mr. Atul Negi and Mrs. Sangita Negi for their supreme confidence reposed in me. Jaya, for her morale boosting phone calls early in the morning, making sure that I never overslept.

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Chapter One

1. Introduction

1.1 Sunrise Industry: Software

“And no matter where you are located in the food chain of Information Technology, everyone is developing expertise in software”—(Yoffie, 1994)

“What do the following have in common: Commuters on the London Underground; customers of Citibank, American Express, Deutsche Bank; manufacturers GE, IBM, Reebok, and GM; and the passengers on Swissair, American Airlines, and Singapore airlines? They all depend on computer software developed in India” — (BusinessWorld, 1995).

Thus have many an article in recent times begun, focusing on the Indian software industry. If there has been a lot of attention on the Indian software, it is because software itself has been in the limelight in recent years. All of us are by now quite familiar with the words ‘Microsoft’, ‘DOS’, ‘Web’, ‘Netscape’, etc. Information technologies are touted as the harbingers of the information age by authors like Alvin Toffler, Naisbitt, among others. Software is the soul of these technologies.

There are very few areas of production, engineering, education or general services that do not include software as an important and increasing complex component. Embedded software is at the core of the machine tool industries, vehicle control, power generation, and distribution, electronic products & telecommunications. Customized software has grown in importance as banks, government services, and

management's of large institutions have become increasingly dependent on computer based technologies for routing operations and management. Packaged software has become, "the driving force behind the development of the personal computer sector and the principal source of its diversity," (Cane, 1989). Many varieties of packaged software are used in such diverse areas as office automation, productivity tools, computer aided design, engineering, education, and manufacturing. It is what can be called an "overriding activity" that like mechanical engineering cuts across many different sectors in many ways, requiring a new range of skills and knowledge.

Software is a booming sector and is growing faster than most other industries. The market for computer software and services is global, intensely competitive, fast changing and fast-growing. The global market, in 1996, for software is estimated to be anywhere in between US\$ 200 Billion to US\$ 300 Billion. This industry has shown a growth rate of 20% and is estimated to continue at around 15%, globally (Schware, 1992).

Thus software export is being increasingly seen to hold promise for many third world countries in dire need of boosting exports (Schware, 1992). Also, there is potential for high value addition. India has been giving it lot of importance since 1989.

1.2 The Indian Scenario

1.2.1 Strengths

Over the years, the Indian software industry has built an enviable global reputation for low costs and high quality. The spiraling revenues reflect this trend. Exports have grown from Rs. 50 Crores in 1985, Rs. 1,535 Crores in 1994-95, to Rs. 2,410 Crores in 1995-96. The Indian industry has grown at a rate that is double the world average.

In 1994, the export's growth rates were 52%. In 1995-96, exports grew by 57%. In dollar terms, these revenues are at a figure of \$ 725 million. This far surpasses the World bank predictions, made in 1992, of \$660 million for 1996. The industry is a net earner of foreign exchange. The earnings have risen to 45% of the total software exports. A total of more than 150 companies exported software worth Rs. 1 Crores each in 1996. There were only 10 companies in this category in 1990. In terms of markets, the USA accounted for more than 50 percent of the total exports. Exports to the Europe accounted for 22% (NASSCOM 1996).

On the quality front, India has been exceptional. Forty-one companies have qualified for ISO 9000 certification and many others are in the process of doing so. The Indian software industry would have the largest number of ISO 9000 certified companies in any industry, anywhere in the world (BusinessWorld, 1995).

So it is not surprising, that a recent World Bank survey of US companies rated India as the first preference for sourcing software and services. This, against seven competing countries—Israel, Ireland, Singapore, Philippines, China, Hungary and Mexico. Over 104 out of the Fortune 500 companies' outsource to Indian companies. With such an established reputation, the Indians are now looking towards new markets in EEC, Australia, South Africa, Japan & the Asia-Pacific regions.

Considering such an encouraging performance, the Department of Electronics (DoE) has formed a committee to study the software industry and its export potential. This committee is part of DoE's 9th five-year plan (1997-2002). This committee intends to target Rs. 21,000 Crores by the year 2002. The chairperson of this committee said that

a paradigm shift is needed to boost software exports to 10 times the present levels (Express Computer, 1996).

1.2.2 Weaknesses

What makes the paradigm shift necessary? The performance *so far* has been excellent. Yet all is not satisfactory for the future.

The basic competitive advantages Indian companies have exploited have been its low cost, high quality English speaking technical labor. Software as it is built today, is still very much crafted. Use of software engineering tools is still not prevalent. Technologically, the prevalent use of such tools will change the way software is built, in a manner similar to the Industrial Revolution, where the craftsworker was replaced by mechanized tools. Under such a situation our labor advantages will simply vanish.

In the trade magazines' complaints & criticisms regarding our software industry abound. For example: minuscule global market share; strategically weak segments; low value addition, absence of innovative & quality product (or packaged software) companies like Borland, Netscape, Microsoft, etc. These complaints are valid. Most of our companies have had a short term focus on earning foreign exchange through low-cost strategies (Schware, 1992). Hamel & Prahalad (Hamel & Prahalad, 1989) explain the folly of sticking to low cost strategies. Regarding the Japanese industry's rise in the world market, they say: "*They [the Japanese companies] moved from inexorably from less defensible advantages such as low wage costs to more defensible advantages like global brands.*" "*These cost-based advantages were vulnerable to changes in labor costs, process and product technology, exchange rates, and trade policy.*" Partly due to the strategies being followed, partly due to the changing world

situation, technologies and markets, our current pre-eminence is threatened.. Reaching the DoE mentioned target is well nigh impossible using current strategies.

The changes listed above by Prahalad & Hamel, have already taking effect, or are imminent. The intricacies of startups now have given way to other concerns. Rising salaries, infrastructure problems at home, and the like squeeze the operating profits through rising costs.. As mentioned above, improved software engineering technology (CASE tools) will negate the current software development process. Growing competition from not only the World Bank mentioned countries, but also from Brazil, South Korea and Taiwan, looms large on the horizon. In this context of maintaining competitive advantages, the ISO certification is just the minimum step to keep ahead in the global market. As Prahalad & Hamel say, “... *Western & Japanese alike are all converging on similar & formidable standards for product cost and quality—minimum hurdles for continued competition, but less and less important as sources of differential advantage. In the long run, competitiveness derives from an ability to build, at lower cost and more speedily than competitors, the core competencies that spawn unanticipated products.*”

Thus, the current concern in the industry and policy makers is how to take their businesses & Indian software into the next phase of growth in the global market. India and its companies have an established reputation now, a small but appreciable market presence. There is still a lot more to be desired. On the agenda is what to do next and how. DoE says that a paradigm shift is needed to reach 21,000 by 2002. Many an article says that we must start developing & marketing software products. But then how to go about it? When the competition is increasing, we need to manage our firms

better. We do not have the reliable knowledge of how to manage software firms better. Are there some models that we can adopt for the improved management of an Indian software business?

1.3 The Scope of The Thesis

This thesis is an attempt to make a contribution in this direction. The focus of this thesis is exclusively on the software industry, and not on the associated, larger information technology (IT) industry. Its focus is on the companies that make software in India. The thesis differentiates the companies on the basis of their output: either service or product. It does not actually focus on the exports' business or domestic markets. The thesis does not mention how to do product marketing etc. It does not delve into the software technology that must be used to develop products. It confines itself to the organizational matters of a software company.

1.3.1 Overview

This thesis subsumes that moving to product development is the paradigm shift required in the India software industry. It aims to find the means to achieve this shift at an individual company's level that is what changes would have to be done to move into product development. So we search for and find, an evolutionary paradigm that lets us continue and improve our current business in the short term. It also sets us on the path leading towards product development for the long-term.

Given that most Indian software companies are into providing 'software services', we hypothesized that the services management literature should help us achieve our short term interests: to continue to provide services. If the software service providers resemble service firms then we can apply service management knowledge as a way to

improve the business. Studying the product developing firms could enlighten us as to what they do differently. The features shown by the product companies are indicative of the changes or competencies that the service providers have to acquire to become product developers. The service literature suggests ways in which the service strategies may be used to evolve into software product developing firms.

1.3.2 Objectives

The research objectives of this work are

1. To verify if software service companies resemble a service organization.
2. To observe how a software product firm differs from service firm.

1.3.3 Relevance

The software industry is too recent to have ready made business management models that could be taught and applied to improve the businesses. Applying the knowledge from the service literature gives us a tested and known way to improve our current services businesses.

Successfully proving the applicability of a services viewpoint gives the manager a readily available, tested model that can give immense insight into how to better manage people, operations, business strategies and view markets. This should be of immediate value to the software managers in the service firms.

Global trends indicate the growing market share of software products. Applying the service strategy of focusing on niche areas and vertical segments through continuous improvement and learning provides a smooth way to transition into quality product

developments in a few years. This can help in developing business strategies for the near future. The evolutionary nature lets the firm change without sacrificing current interests or radical departure from current strategies.

The software literature has focused mostly on software engineering. Literature related to software management has confined itself mostly to individual projects and teams producing software, or to situations in the Data processing or Information services departments that develop software for the limited use within a larger user company. There has been very little work and that too very recently that deals with companies that develop software only for the market at large. This work is a small step towards filling this large void.

1.3.4 Structure of the Thesis

This chapter introduces the software industry and gives a brief overview of the thesis. The next chapter reviews the literature. The software industry is a very recent industry and has some peculiarities. The first 2 sections of the literature survey attempt to provide some insight into the industry and the peculiarities of software itself. Then some important sources are reviewed that explain the state of the Indian software industry and its salient features. These papers highlight the predominantly software service nature of the Indian industry. These thus suggest the possibility of using a service management based framework to understand the management of our software firms.

The third chapter builds the research framework. The services literature is taken up based on the traits of the Indian software industry as suggested by the literature review. The fourth chapter explains the methodology.

The next chapter onwards deals with the data and its analysis. The data collected is explained in 2 chapters, the fifth and the sixth. The fifth chapter introduces the organizations and details the organizational structure. The sixth chapter presents the remaining cross company data in view of the research framework.

The seventh chapter summarizes and analyzes the data. The last chapter discusses the conclusions to be drawn, the learning's from the work. This chapter also discusses the strengths and weaknesses of the present work and mentions some of the possible future work that can be done.

Chapter Two

2. The Literature Survey

“Software production may be the first business activity of the Information Age. The factors driving profit, revenue, and costs are quite different from those of the Industrial Age. For example, the replication cost of word-processing software (copying and mailing a diskette and manual) is insignificant compared to the replication of a car in an assembly line”—Olsen (1994).

2.1 Introduction

Broadly, the problem is of strategic management and a search for management models for software. Thus the early literature scan was made with an intention to uncover material on managing software companies, managing software development, & anything on the Indian software industry. Some key papers on strategic management were also reviewed. This chapter develops a background for understanding the business of software and builds up to the research framework. First the strategic issues are explained, then the nature of the software delved into. These two sections are primarily to further understanding of peculiarities of software and some business issues surrounding it. After this background, the dynamics of the software industry are explored. The literature suggests that a service conceptualization of the software industry seems a promising avenue to understand the workings of the companies. This idea is arrived at in this chapter and the next chapter develops the framework based on this idea.

There was found to be very little management literature specifically focused on the software industry. What is available is spread thinly across journals and the trade magazines. The literature search revealed three articles of significance. These specifically dealt with the Indian software industry. Yoffie (1994) is probably the only author that was found to deal explicitly with the strategic issues in IT.

2.2 The Strategic Issues in Software

Yoffie (1994) highlights some interesting traits that are common to the IT industry and cuts across all the subsets (see Appendix 1). The points to note are that

1. The industry is *inherently global* in scope. As mentioned in the introduction earlier, IT has become an infrastructure industry, the demands for which are the same world wide. This implies that companies must have an international mindset from the outset.
2. Yoffie also notes that the managers in this industry have to be technically proficient to survive. The tremendous rate of change in the technology would *necessitate technically competent managers*.
3. He remarks on the *strategic advantages of being the first*. This coupled with the rapid technology change demands that one bring out new products incorporating the new technology to replace the still successful product that incorporates the old technology. That is, the early bird gets the market. The effort to dislodge entrenched 1st movers is possible by using the latest technology to make obsolete older technology based products. In other words, the one's first to utilize or exploit the latest technology will reap

tremendous benefits. Thus to prevent being shunted to the side, one has to continually invest in acquiring and incorporating new technology.

4. Yoffie also clearly lays down the *alliance-friendly* nature of the industry. This goes hand in hand with the global scope. For example, Apple Inc., IBM & Motorola aligning together for the PowerPC combine, the 'wintel' (MS-Windows & Intel) alliance, etc. Companies with different strengths band together to complement each other's skills.
5. He describes the *blurring of the boundaries among industries and across segments*. To illustrate the point, Microsoft is into computer games as well as into operating systems. The recent spate of mergers in the US shows the hereto channel providers like McCaw venturing to be content providers as well. On the other hand, a company like Netscape has turned into a phone company with the netphone technology in its software. This blurring of boundaries is accompanied by *everyone developing capabilities in software*.

The significance of Yoffie's descriptions is in highlighting the strategic challenges that the management model must incorporate. As we move towards our objectives of searching for a suitable model, we shall depend on these traits mentioned above to guide our assessment for suitability.

2.3 The Nature of Software

This section attempts to highlight the nature of the software that makes it difficult to apply general management techniques (see Appendix 2). What is it about the technology that needs to be mastered? We will attempt to see what makes software different. This section is an attempt at gaining some insight as to what is software.

There has been considerable dissatisfaction with the development & use of software. This has been often called by the term “Software Crisis” (Pressman, 1987). That it did not deliver the required results; failed at critical junctures; most common: simply took too long and costed much more than the budget, (these complaints can be found reiterated in the introductory chapters in almost any text on software engineering or articles in early issues of IEEE Software, Software Practice & Experience, etc.). Comparisons have been made with other engineering disciplines and many conclusions drawn as to its inherently different nature as the source of management problems (for example see the USENET discussion in Appendix 2).

Easily among the most celebrated books in the software arena is the classic by Brooks (1975). The book’s 25th year since first publication was celebrated with a special edition and considerable coverage in the professional journals. His opening sentences seem to prove Yoffie’s comments on mastering technology. “In many ways, managing a large computer programming project is like managing any other large undertaking—in more ways than most programmers believe. But in many other ways, it is different—in more ways than most professional managers expect.” Further on, he states “This book is a belated answer to Tom Watson’s probing questions as to why programming is hard to manage.” Brooks answers the questions in the first chapter (See Appendix 2). Among other points that characterize software programming, he lists the medium’s tractability, a nonrepeating nature of job, the lack of control over the goal of work, or its circumstances and lastly, the rate of obsolescence. He regards the systems product as the ultimate goal of every programming effort. The key feature of this is its generalization. Not only in terms of inputs or algorithms but also in terms of its availability & applicability over various systems, and also in its usage with other

programs/products. Brooks also emphasizes the testing and documentation as part & parcel of the product.

Yoffie & Brooks are of one view regarding the rate of obsolescence. An important feature that is brought out by the USENET discussion in Appendix 2 and highlighted by Brooks, is the power & effect that other people have over the programmer of the product. The software is made to fulfill some objectives. The software engineer codes the software, but he is not the one whose objectives the software is to fulfill. This person whose objectives are to be fulfilled is the person who affects what work the software engineer does. Often this is the management. Or as the USENET discussion mentions, a key customer. The discussion also highlights the tractability of software, as does Brooks. The customer/management understands the tractability of software, but not the difficulty in making changes correctly. Thus they may change what they want, and force the software engineer to implement those changes, without giving sufficient resources to implement the changes correctly. Deadlines are not met or the software is faulty and the customer is dissatisfied resulting in penalties to the software engineer.

Most of the problems mentioned regarding the development of software are addressed by the field called software engineering. And there has been an explosion in this field as it has matured since "The mythical Man-Month". The field does not deal with the business management aspects of software. A lot of software development activity has traditionally taken place within larger organizations and the literature seems to reflect that focus. Yoffie (Yoffie, 1994) has written some cases with regard to one or two software companies. There seems to be a vacuum in the literature regarding the

organizational structures in software companies, as opposed to the MIS or EDP structures in a company.

So far, we have seen the characteristics of the IT industry and then we have understood independently, the characteristics of software. We now see what the literature says about software industry and in particular the Indian industry.

2.4 The Nature of the Software Industry

Jain & Bhatnagar (1991), Korwar (1991) and Schware (Schware, 1992) describe the software industry and concerned themselves with the Indian software scenario. NASSCOM's periodic reports provide one with information on the current status of the industry.

Schware (1992) was helpful in gaining an idea regarding the world Software sector:

1. There are two key market segments—Software packages and system integration services. System integration's includes project management, requirements' analysis & design, contract programming, subsystem integration, education and training and ongoing support and maintenance. The software packages or products, are like OS packages, DBMS packages, generic and vertical application packages. For example MS Word, Matlab that are generic; vertical application packages are like EX, Tally, Microbanker which target a specific area like accounts or a specific industry like banking.
2. Sector Dynamics: There is a trend towards the production of packaged, 'shrink wrapped' software away from customized programming services.

Another trend is the verticalization of the market. *The software market has become ever more specialized by end-user segments* (italics ours). This is because each sector has its own characteristics in terms of data processing expenditures, environment, level of information intensity, and importance of vertical applications. Traditionally, end-user sectors have been segmented as financial service, manufacturing services, and government & defense. But this segmentation is also changing, as other subsectors become attracted to developing software. There is increased evidence of former users of IT coming up with their own products in their sectors to make profits of their investments made for their internal use.

3. Changing Skill requirements: “Software development is not an easy task since there is no simple set of rules or methods that work under all circumstances”. There is considerable agreement in the software industry that experience plays a very large role in the development of a good software engineer. “Software is still a craft sector, which depends on talented people—perhaps the most important element in any software organization”. A lot depends on the software organization’s approach and management of the entire software process. There is going to be a long-term decline of routine or low-level programmers, and an “increase in demand for higher level computer, software, & communications expertise, with business knowledge.” There will be an increase of the growth in the end-user computing.

After explaining the world scenario, he goes on with 2 case studies of India and Brazil. These third world countries have diametrically opposite approaches to develop their software industries: India through software exports, Brazil through encouraging a vigorous domestic market. The main thrust of this paper is that for sustained world standard's performance, both the approaches are needed eventually; neither alone is successful. He advocates a 'moving from domestic to exports' strategy involving products. The domestic market he says helps to develop capabilities in the market niche, to form skills and diffuse knowledge within the company. He supports his idea with an example of Kale Consultants in India.

Regarding India's case he has the following points to make:

1. Emphasis on low-level programming overseas: India's software sector as focused on onsite services abroad, known as 'body shopping' or 'manpower contracts' in which Indian firms undertake mostly the routine task of coding and debugging rather than design, analysis or project management.
2. Plans Vs. Performances: The government makes over optimistic plans based on alluring data available on the 'world' software market. But piecemeal policies make these plans far-fetched. "The right policies in this sector should lead to building higher level skills in software engineering, improving communication infrastructure for tie-ups with foreign software firms, and making available the latest software and development tools for producers. As a result of not having these policies in place, the software companies and government have generally supported an export, labor-intensive approach".

3. Labor demand and supply imbalance—the low-skill trap: “It should be noted that at this time there is no formal or informal training program for software engineers in India, and no training covers project management.” There is a low supply of software engineers and that the supply of system analysts is restricted to the in-house training done mostly by firms. “In sum, government initiatives and private sector training organizations have mainly produced trainable labor with an aptitude for data entry and coding while the industry increasingly needs trained labor for analysis and management.” The focus on onsite-programming service in export work has for India resulted in a tendency to be self reinforcing, with analysts lost to foreign companies or never developed.

Overall Schwabe paints a gloomy Indian picture. The points to note are the movement globally towards products and verticalization of markets according to end-user segments, the Indian focus on low-level coding services, and the improper labor situation existing in India. Today, we are in 1996, and the situation has changed for the better, since his paper. Offshore projects have begun to bring in bigger chunks of revenue compared to onsite services, but still the onsite business is markedly high. This situation implies that India has acquired some project management skills, the lack of which, Schwabe bemoans. Though we now do more offshore projects, most of these projects are still the coding ones.

Bhatnagar & Jain (Bhatnagar & Jain, 1991) analyze the Indian industry in great detail. They first state the traditional market segmentation of the software market. They are: Packaged software, Customized application software, System Integration, and Processing Services. Each of which can be further subdivided on the basis of hardware,

software platform on which the package/application is implemented. Then they analyze the global trends, stating similar trends as Schwabe. They state the sectors that India has exploited in the past. India has largely exported software in the customized applications software segment & in development and coding projects of system integration. Of the customized development market segment, they identify some sub-segments—projects involving the full software development cycle (specification, design, coding etc.); projects involving coding only; and projects involving maintenance of software¹. Traditionally India has tapped the market for coding, which is low risk, low value-added. The primary advantages were the plentiful availability of low salaried programmers here, and their English speaking nature (English speaking markets were 62% of the world market (Schwabe, 1989)). They state that this segment is only 1.7% of the world software market. Of this segment, India had about 4.3 % share in this market.

They then analyze the international competition for exports and the Indian software industry's growth. And propose some suggestions. They find the current segment to be under threat of advancing software technology like CASE tools that does away with low level programming. Also they state increased competition from not only other third world countries having cheap labor but also from the exports of developed countries.

They advocate a multipronged strategy that calls for entering other segments of markets existing in the world. For the turn-key segment, they advocate developing market niches by specializing in selected applications/industries. In the turnkey projects' segments,

¹ These are now called re-engineering projects that involve transforming the functionality of the old system on to newer hardware and software platforms. This may even be conversion of the old system from its old language COBOL to using the more recent C++, etc.

competitive advantage is derived from prior knowledge of a sector and a demonstrated ability to design and deliver the software. They also recommend going into the products segments, by utilizing our traditional strengths of education, rural development. They advocate going in for such specialized markets, which would be small, attract lower competition.

The main thrust of this paper is to enter vertical markets and in time, bring out products. They highlight the vulnerability of the current focus of the Indian software industry. Since the time of the paper, things have improved. The communication links that they advocate are now in place. The lack of suitable training facilities they mention is not so critical, though it still exists. Both, Schwere above and this paper mentioned the lack of availability to hardware. Today, this problem is not critical anymore. Yet even today, most of the smaller companies do depend on the onsite services. And even the more established players earn a huge chunk through onsite services.

Korwar (Korwar, 1991) analyzes the structure of the industry using Porter's framework. His market segmentation differs from Bhatnagar & Jain. Korwar identifies a 'Systems management' segment besides the customized software segment. He notes that the most important success factor here is "the deep, ongoing knowledge of the customer's business." To gain this, he advocates going in for strategic alliances with suitable firms abroad, so that the Indian employees get access to world-class business practices. He notes that India's competitive advantage lies not in price but availability of people.

All the three papers reviewed above note that most of the companies in India are into the software exports business with a short term vision limited to making foreign exchange. All agree that relying on the current business strategies are not viable in long

term. They all bemoan the dependence on the coding segments of the market & note its vulnerability. They all, in different ways suggest rising along the business processes & value chains of the customers.

The Indian authors suggestions seem to be based on an analysis of the markets and other secondary information. There was no literature available that mentioned the internal operations of the software companies.

The papers mentioned above are of the early '90s'. Now we move onto the data available today describing the current state of the industry. NASSCOM (NASSCOM, 1995) states that the bulk of the Indian software activity has been in the 'professional consultancy', 'customized ' or 'turnkey ' project development. That is the projects involve developing software according to the specific requirements of each client. Just above 60% of the work is being done "onsite" (i.e. developer is at the client's workplaces). The "offshore" (i.e. the developer is not at the client's site) development was 38% of the total exports and is expected to rise further. There are said to be more firms in India who provide such software services.

"Products & Packages " are around 38% in the domestic market; 10% in the export market. These products are standardized software that are built from generic requirements i.e. not built with a specific client in mind. e.g. DBMS, word processors, etc. These figures include products made elsewhere (not in India) and then sold from here.

The 1996 report released in June 1996, (Express Computer, 1996) mentions that 1995-96 saw an unprecedented global outsourcing shift towards India. Out of the Fortune 500 companies, 104 outsourced their software requirements from India. The onsite services

contributed to 60% of the export revenues, with offshore 40%. Given the tremendous amounts of growth rates, and the supporting market trend, it appears that India has an established brand identity in the program outsourcing market. Our quality track records and the an established image among the clients give us Yoffie's 'first-mover' advantages. In the sense that compared to the other developing countries vying to exploit the huge software market, we have established a reputation before the others.

2.5 Identifying the Framework

Reviewing the information above, clearly the world market is growing. In such conditions, any and all companies can make earnings. A serious incongruity strikes that though the world wide trend is towards packaged software, the Indian industry is making hay in a vulnerable niche. In the domestic markets, India has not many products and those that are, have not had the impact that packages as Lotus-123 had in the US. Why is product development lagging in India, especially in the exports segment?

The papers above suggest moving into associated areas. But there is no mention of how and what changes the organizations must undertake to be able to do so. There is no mention of how to manage this change. There are some other papers, but none mentions solutions on an organizational level. In our search for information on the management of software businesses, we found only industry wide suggestions. There is a need for understanding how Indian software companies function.

Brooks, Schwabe and a host of others note that managing software is different. The software industry itself is recent enough not to have developed sufficient knowledge about its own management. Then which among the streams of business literature can we

turn to, to understand the workings of our software organizations? How do we classify the organizations so that we can begin to understand its workings?

All along in the literature is the mention of software services and software products. Yet there is no paper anywhere that explains the differences in providing these. So suppose we were to stop thinking of our software companies as software organizations. Instead what if we start thinking of them as organizations providing just services and products? Ignore that they are in the software market. We find that a whole new approach seems to open up. If we ask the fundamental question “what business are we in?”, we must be wary of an answer of “in the software business”. From what the papers suggest, it would be better if we described it as “in the business of supplying manpower, more particularly programmers”. Even today, with increasing off shore work being done, essentially we are supplying programmer services, not software services. Which is what Korwar explicitly points out (see above). This is an unmistakably service operation, albeit hi-tech manpower service. One may say that it is too much of a simplification. The point is not of oversimplification. The point is utility. Given the software industry’s greenness and it’s acknowledged management difficulty, how much insight and guidance can we draw from being “in the software business”? It seems better if we redefine our current state as being “in the service business” or if more precision is required, “in the personnel services business”. This is more useful to us, given the state of knowledge in the services domain.

One finds that there has been a sufficient amount of research in the services sector of the economy and the results are now out of the research journals and into the popular domain. And services too have been established to be very different from traditional manufacturing and other industries. The insistence of the software experts (as typified by

the discussion in Appendix 2) that software activity is different from traditional manufacturing can be seen as an implication that software activities could be similar to service activities.

Riddle (in Bowen et al., 1990) mentions that services must view itself as operating in an international environment with regard to multi-cultural customer groups and potential foreign competitors, though they be targeting domestic customers. This implies that services too are inherently global in nature. This matches with Yoffie's comment on the IT industry. As Brooks notes, that other people control the actions and goals of software programming. This is akin to the services problem where one is dependent on the customer, controlling the service provider's actions. Heskett (in Bowen et al., 1990) notes developing customer switching costs as a service strategy. This resembles the lock-in phenomenon Yoffie observes. He goes on to remark that services suffer of an ease of duplication of a service and that nothing remains proprietary for long. This would suggest a situation similar to the IT's needs to cannibalize present successes. Riddle further emphasizes creating strategies that prevent easy duplication of services to maintain competitive advantage. This compares with trying to lockout competitors in IT industry. This is a trend seen among the IT industries. E.g. Apple first incorporated the GUI (Graphical User Interface), soon Microsoft duplicated it and now a GUI is a *de rigueur* in the software domain, irrespective of the platform.

Given the above comparisons, the services model seems very suitable means of viewing the software companies. This has the advantage of being an established body of work. This kind of view seems more appropriate given NASSCOM's figures of "professional

services” dominating the Indian exports. It will help us to understand software management, if indeed the software services can be managed like any other services.

This chapter created the background for understanding the software industry. It described the progression of the literature survey that leads to the services framework of the thesis. It shows the rationale for adopting this body of literature to view the software companies. The next chapter explains the utilization of this body of literature to formulate the research objectives and establish the research hypothesis framework for the study.

3. The Research Objectives and Framework

3.1 The Research Objectives

In the first chapter, we began our search for management models to conceptualize the software industry. In the previous chapter on the literature survey, we arrived at selecting the services paradigm as a promising way to understand our software industry. We mention the literature on the software industry. Though the literature does not mention any management model, the terminology expressed, directs us to one. The emphasis that Indian companies are only into the software services; NASSCOM's report that the bulk of the income comes from 'professional services' 'consultancy', etc. suggests that we could conceptualize the companies as being service providers and ignore that they are in the software business. This chapter builds on that idea to arrive at the research objectives.

We proposed that the services framework appears a favorable conceptualization to examine this industry. Now how to test if the framework is applicable? To do this, we have to find if the software firms resemble or display characteristics typical of service organizations. We have to find if those companies that produce software products display different characteristics from the service organizations. And what are the different characteristics?

What is the use of such a framework? If the two are indeed different, we would have gained some foothold in developing appropriate management models for this industry. By drawing upon the services literature and experiences, we can make definite and

tested suggestions for better managing the firms. The least one can be sure of is that there is a body of knowledge to draw similarities and adapt for the current situation. In the process we would have gained some idea on the operations of software businesses. The service companies could prefer to stay in the service segments. Then by adapting the service literature for their purpose, they learn to manage as a service firm, improve their organization & operations to stay ahead of the competition. By comparing their differences with the product companies, suggestion for an evolutionary path can be found. Given the strident need to develop products, this would be very useful for the predominantly 'software services' oriented Indian companies.

More clearly stating, our objectives are to find:

1. Do the Indian software service companies resemble typical service organizations.
2. How do Indian software service companies differ from their product developing counterparts.

The focus in this study is on those firms who **develop** software *within* India. The objective stated above does not exclude companies with non-Indian ownership. It encompasses all those that operate from India, that are based in India, who do development work in India. It excludes companies who develop outside India but have a presence in India. For example the distribution of imported products lies beyond the scope of the study, and the focus will be on that sub-unit of the organization that is doing developmental work here. The distribution of imported products, does not impact on achieving the DoE set targets. Developing from India and then selling it leads to the increase of the industry's revenues, which is what we are attempting to

aid. We assume that product development is the paradigm shift required to achieve the DoE set targets for 2002. With this assumption, we study the differences between product and service software companies in an attempt to find what is needed to change a company from a service oriented strategy to a product based one. We thus develop a framework that seems to explain the workings of a software service company. We will observe how a product firm differs from this framework.

We now have to identify the service characteristics that ought to be displayed by the software service organizations. Before that we will have to define the terms service & products.

3.2 Building the Framework

So far we have discussed service and product. We now explain these terms in the context of software.

3.2.1 Definition of service & product as used in the study

Gunther (Gunther, 1978) states the assumptions that differentiate software products (Ref. Appendix 3). Considering his assumptions, and the definitions given by Bowen (Bowen et al, 1990) (refer Appendix 3). This study uses the criteria given below to distinguish between the software service and software product.

1. The source or acquisition of the specifications (requirements) for the output.
2. The customer's involvement in the transformation of the specifications.
3. The intended end user(s) of the output.

From the above, **Service** is defined to be the outputs that are produced for use by a specific customer, on the specific request of that customer, who remains aware and/or involved in the transformation of the requirements that have been arrived at by common agreement by the provider and the customer.

A **Product** is defined to be the outputs that are produced for use by a non-specific customer, who is unconcerned with the transformation of the requirements, that have been arrived at by the provider in an independent fashion.

That is products are standardized software that are built from generic requirements i.e. not built with a specific client in mind. This is the same as Brooks (Brooks, 1975) requirements for a programming systems product. The above definition also implies that the customized software developed is used only by the customer (see Marx's comments, Appendix 3).

Thus *Service firms* are defined as those firms whose 60% or greater revenue comes from the delivery of software service packages for the clients. *Product firms* are defined to be firms whose 60% or greater revenue comes from the delivery of software product packages.

Please note, that there are rarely pure service companies and rarely pure product companies. There are degrees of their mix (Kotler, 1994). For the purposes of the study, we take them to be pure. Including the in-between types will complicate the study. It will divert us into the intricacies of the definition of product and services i.e. when does a company begin to be called a service company and till when is it a product company? Here, all we need is a gross identification of service-like or product-like

3.2.2 Distinguishing Features

The services literature (Bowen et al, 1992) espouses the thought that if the prototypical service differs from a prototypical good then the systems by which goods and services are produced may also differ. Above we have defined the services to be different from product. Therefore one would expect the organization that produces these to be different from each other. Appendix 3 excerpts issues arising in services organizations. Considering these issues, we develop the points for observation that would indicate a service orientation or not. The focus is on finding organizational characteristics that would facilitate in distinguishing.

Firstly, we would expect the role of the customer to be different in the two cases. The services production would not start till the customer proposes the requirements. Also, we would expect the customer to involve in the development process. Not so in the product company. There the product develops without a customer's prodding. Hence the first point of observation is the origin of the requirements and the customer's involvement in the developmental process.

The marketing function should be the next point of difference. According to services management (Bowen et al, 1990), The marketing of the service is not easily decoupled from its operations. Besides marketing skills, the technical competency of the service provider is important (refer Appendix 3, the customer—service-provider—technology interactions). Hence the fellow who does the marketing job or who contacts the customers should come across as knowledgeable and competent. So he should have had development experience. The marketer would be one who has been through the development operations. The true power to retain the customer lies with the service

provider, the developer in this case. Therefore the developer must also display marketing skills. The marketing role of a person in service would be more of a liaison than true marketing. The product firm instead can isolate its development task and thus it should be having a need for specialist personnel for the marketing task. In selling a product, it would be more important to be able to convince the customer how the product is useful to the customer. Technical competency on part of the seller will not be seen as an implication of the technical perfection of the product. There is no requirement that the marketer have been part of the development team.

Now a third feature that should distinguish between the two has similar origins as the above. This is the specialization of activities of the software lifecycle. If it is not easy to isolate the development from the marketing, and there is little control over supply and demand, than for efficient functioning, the services firms should show multiskilling. There is another thing involved. If the technical relationship between the customer and the service provider has to be intimate to foster free flow of information, then changing the service providers midway through the project may not be permitted easily by the customer. If the personnel are specialized, they would emerge as bottle necks, by getting blocked with a lesser numbers of customers. This might not prove to be efficient utilization, specially given the current market situation. Thus it would be another disincentive to have specialized developers for each portion of the life cycle (See Appendix 2). For example, James Sims²(1995) mentions, in his company, the same people go through the entire project from first concept to the application roll-out.

² James Sims is the CEO of Cambridge Technology Partners. An interview with Sims was found in IEEE software. The business profile seemed to match well with what most Indian companies are said to be doing. The interview mentions a lot about how this company goes about its business. The descriptions matched very well with what the service management suggest. We took these as a prototypical software services company.

The product company would have no such customer problems. They are in a position to isolate the developmental function, so they should show specialization of the tasks of the software lifecycle.

Another point that should help us characterize and distinguish service company is the training & Human Resource Management. This is because the quality of the selection and training of the services personnel spills over to affect the customer's perceptions of the quality of the service they receive. Since customer interaction is a necessary feature of the service business, the personnel must have 'people' or behavioral skills. Sims mentions that the most difficult part of their hiring process is to find people with both, technological and behavioral skills. Thus the training aspect in service firms should be showing a prominence of interpersonal skills training for everybody. The product company should have no such need to train everybody in interpersonal skills. Nor would it play an important role in the hiring of the development personnel.

In what kind of organization do the service companies work? Given that the service providers need more autonomy in carrying out their work, decentralization is required. Yet one needs standardization to achieve uniform quality in the service and cost effectiveness for the business to run. Also, the service providers must be highly skilled and trained. Under these conditions, Mintzberg's definition of a 'professional bureaucracy' (Mintzberg, 1979) (also see Appendix 3) suits the organizational framework for service organization. For the product organization the 'machine bureaucracy' configuration should suit. This would seem right because of the differentiation between the marketing and development teams that we expect. That is a functional grouping of people would occur in the product companies resulting in a

machine bureaucracy kind of organization. A need for efficiency would prod a machine bureaucratic organization in product companies.

3.3 The Frame work

We can summarize the above discussion in the following points of the framework:

- I. Origin of requirements: What is the source of the requirements that drive the development process? What is the extent of the customer involvement in the development process?

In service companies, the customer initiates the development work and is involved in the development process till the end.

The product companies develop the requirements internally & independently of customers. And once generated, the development team has full control over the development work till the product is ready for testing. In this process, the customer is unaware and uninvolved. All that a customer can contribute towards the development work is feedback through suggestions.

An effort is to be made as to broadly trace the process of the development work in both the cases. In particular how do the product firms get to the idea of their product.

- II. Integration of the Marketing task with the development task. To what extent is the developer involved in the Marketing?

Service companies should have lesser forces devoted specifically to marketing. Those that are, have been technically trained in the development work as well or have been/are developers. They could be on a rotational basis.

Product companies will have elaborate marketing arrangements. The personnel here will not be expected to have had development experience or technical backgrounds.

III. Specialization of the development tasks. To what extent is the software lifecycle³ task specialized?

Service companies will depict lesser specialization between the functions.

Product companies will depict specialization in the tasks.

IV. Training & Human Resource Management: What kind of training is given and what kinds of people are recruited and promoted?

Service companies will emphasize interpersonal skills while recruiting, promoting and in training programs. All the persons who involve in marketing or development have technical training. There could be customer involvement in these aspects.

Product companies will recruit depending on the expected placement, i.e. people expected to carry out development functions will be required to have technical qualifications. Those in the marketing aspects need not have technical

³ The software engineering, life cycle (see Pressman, 1987). Functions start from the requirements generation, specification, highlevel design, low level design, coding, testing, installation, training, maintenance. Often included after testing is the documentation, generally it is expected to be an continuous parallel activity at all stages. Some texts do not include user training as an software engineering activity. Nevertheless, it is part of the cycle of software development and usage.

qualifications. The promotions are based totally on the companies internal evaluation systems. The customer has no role at all in any of these functions.

- V. Organizational configuration. Into what departments is the company organized into? Are the companies organized functionally, or market wise, what are the numeric strengths of the departments?, etc.

Service companies will not have elaborate departmentalization. There is no formal attachment to particular division. The persons will be allotted a group according to the 'job' on hand and demand across the company. The operating core would be dominated by developers. The middle managers or the senior managers would be the real arbitrators of business directions. The quality function is the technostructure but not so well established due to the customer's being the final authority on quality.

Product companies will show well formed and stable departments. People will be placed within the respective departments and expected to stay there and perform only that department's job for all the time that they stay there. Formal transfers are the means of movement across departments and not easily done. In the operating core the developers numbers will not dominate the operating core as marketing too is equally important. The Strategic Apex here does have power and sets the business directions. The developer has lesser autonomy. The technostructure is the quality function and should play a major role.

In the next chapter, we will outline the execution of the research to explore the points above.

4. The Research Methodology

This chapter explains the research methodology. The approach to the study, the decisions involved, the execution of the study and some of the experiences of the study are outlined.

4.1 Methodology

The case study method was deemed suitable as the means of conducting this study. As per Yin (Yin, 1984), the following indications suggest a case method.

- The study is primarily of the 'how' type. We attempt to demonstrate if and how most Indian software companies resemble service organizations. We have to show that the product companies differ from their service oriented counterparts and how they differ.
- The investigation concerns the companies as they are today, in their real life context. We have no control over the phenomenon.
- The study has a slight exploratory nature. There is insufficient knowledge available apriori. To better understand the events we need to observe the context as well. We need some flexibility available if the reality data differs very much from our prepositions.

The organization is the unit of analysis. A primary reason is the indication of the services theory of the inability of service firms to differentiate their operations from marketing and other aspects of the organization. Thus we would have to view the

company in a holistic manner due to the expected tight linkages. The tasks of the marketing, development and their organization as well as the training aspects are primary concerns. Information on the other tasks like Human Resource Management, Finance etc. is needed to comment on the organizational typology.

4.2 Identification of the Firms

We need to look at firms that are stabilized, that are beyond the struggles of entrepreneurial stages. This condition implies that the firm has been successful and doing well. It would be in these kind of firms that the work processes and methods would have had time to stabilize.

Also for our purposes firms purely into either service or products would be the best. The study intends to confirm if the service-product framework is applicable. For this we need companies that purport to be in the service business, firms that purport to be in the product business.

We selected the companies from the publicly available “Top 20” or “key companies”, etc. annual lists. These lists specify the businesses the company is dealing in. For example, “Computers Today” in its “101 Key companies” lists the activities as ‘software & consultancy’, ‘packaged software’, ‘Training’, etc. “Computers Today” also publishes an annual “Best selling Indian software” list that mentions the best of the Indian-made software. The “DQ Top 20” special edition of “Dataquest” has small write-ups on the companies that make it to their lists. There they mention the details of the companies, its market offerings, etc.

Thus we identified thirty such companies that qualified for our purposes. They all were successful with revenues of greater than 10 Crores, had been in the market for at least 2 years.

4.3 The Data Collection Process

We wrote introductory letters to the CEO's of all the 30 companies. We mentioned the purpose of the study, who is conducting, and requested their cooperation for the study. We indicated the academic nature of the study and assured them of confidentiality. We had initial responses from 10 companies. The final study was conducted on 7 of the respondents. It was observed that the firms with Indian ownership's were very open and enthusiastic in their wording.

The study has been a confidential one and thus the names of the companies have been changed and not all the information that was made available is mentioned here. As far as possible, all attempt has been made to disguise the true identity of the company.

The service companies will be indicated by the letter 'S', suffixed by a number to differentiate from the other service companies. The product companies will be indicated by 'P', with a following number to differentiate between other product companies. The company involved in both is indicated by 'PS1'.

Of these 7 sites, 3 were purely service providers, 2 were pure product developers. One company was committed to products and had major revenues from product exports, but also had some customized software business. It has been included as a product company as its service operations were not looked into. One company had decided to

focus on products and had begun its transition from service. This company provided services and also did product business.

The following name convention is followed :

- The service companies visited are : S1, S2 and S3
- The product companies visited are : P1, P2, P3
- The company involved in both is : PS1

After the initial responses were received, we collected secondary data on these companies. The sources were the trade journals like “Dataquest”, “Computers Today”, “Express Computer”, “PCQuest”, etc.

After the travel plan was fixed, the visits were made in one trip covering all the companies. The time given to each company varied from a week to ten days depending on the availability of the interviewees. The person with whom we had corresponded with, was contacted. This person then suggested the persons to meet, after ascertaining who was available, and who could be the right person. Then a plan of appointments was made. The interviewees were informed and their confirmations were awaited.

On an average it took at least 2 days before the interviewees responded and the interviews could begin could actually start. Meanwhile efforts were made to get documents on the company, like their marketing brochures, annual reports, etc. It was attempted to get the quality manuals of the organization before the interviews started. These manuals document all the processes of the company, personnel’s responsibilities at each level, the organizational structure, personnel policies, etc. It enables one to

grasp as much of the company as possible and saves a lot of time and effort during the interviews. These documents are classified information and not easily allowed to be viewed unless the CEO or head of quality permitted it. These documents sometimes were made accessible towards the end of the stay at the company. Then they were useful in filling some gaps or clarifying some issues.

The interviews took at least 20-30 minutes. Many were longer if the interviewee could manage it. Sometimes there were repeat interviews to clarify some details or interlinkages. These interviews were shorter, sometimes over the phone. Extensive notes were made during the interviews. The interviews were semi-structured. There was a small set of standard questions asked of every interviewee every place. There were other questions that would occur there to comprehend what the interviewee explained. The interviews began with introductions on both sides. The questions first focused on the interviewee: the person's background, experience, period in the present company, etc. Later questions pertained to the work of the person, the group and the interactions of the person with superiors, and subordinates.

The interviewees typically were the middle managers, heads of departments, or heads of groups or projects. There were interviews with some of the fresh developers but these were not often. There were also some interviews with the CEO. This was not always possible.

There were no interactions with the people from finance. The interactions were limited to the people involved in marketing, development and HR.

4.3.1 Presentation of the Data

The data was sorted out as per the points of the research framework. They were then analyzed with a view to detect & explain similarities with the service literature. The data is presented beginning with the observations seen in the service operations, and later, the corresponding product operations.

The data has been split into two parts. The first part besides presenting the organization of the companies, also serves to introduce the company. The introductory details include information on the business of the company, its strategy, markets, some general or miscellaneous information not included in the framework but observed and impressions. The basic purpose of the introduction is to get across a greater feel of the company as a whole. This is then followed by the details of the organization of the company

The second part deals with the rest of the points. That is the source of requirements, integration of the marketing with the development function, the specialization and the training and human resource management issues

5. Data - I : The Organization

This chapter and the next, present the data collected. This chapter serves to introduce the companies studied. The details of their organization are also included here. The next chapter discusses the rest of the points.

5.1 The Service Companies

5.1.1 The Company S1

5.1.1.1 Introduction

S1 is the software service division of the information technology subsidiary of a large diversified corporation. This corporation has interests in financial services, computer systems, software, lighting, edible fats, soaps, etc. The corporation is one of the top 100 publicly held companies in India. S1 was formed with the objective of providing software solutions to the world market. Initially it focused on products, and had a few successful products, some of which survive to date. After it's first 5 years it had a strategic reorientation and went in for customized software development. This led to rapid growth and today it is one of the largest software services provider from India. Revenues as of 1995-96 are above Rs. 150 Crores.

5.1.1.2 Strategy

As of today, this division is committed to software services. Quoting its marketing brochure "S1 offers a range of software services, with strengths in maintenance and enhancement, re-engineering, conversion, testing, porting, system study, and system development". Some of the managers expected another shift in strategy back to products in the coming years. The firm goes in for long term development of

relationships with some major clients. These often are developed by the first few people assigned to the client. They are supposed to find out how best to grow the business with that client. For other projects, the SBU (Strategic Business Unit) chiefs and the CEO do the planning.

5.1.1.3 Market

Among S1's "clients", it lists some fortune 100 companies, some of them being among the biggest telcom companies of the world, among others worldwide. S1 believes in building its relationships with clients into long term partnerships. Its major focus areas are the United States of America, Europe and its large account clients.

5.1.1.4 Impressions

At the city of its inception and its headquarters, the offices were spatially dispersed at 3 places. S1 has another development center in another metropolitan city. The study focused only on the development center in the home city. The President of S1, and the offices of the HR group are in one building. Most of the other departmental heads are located in another building nearby which also serves as the primary development center. The development offices of the large account clients are physically separate from the offices of the rest of the projects. That is S1 devotes discrete facilities to each of its large account client's works. The people in such dedicated facilities work as an extension of the client's facilities. The company has a dress code, that is relaxed on Saturdays. The building of the offices most often visited was shared with many other firms as well. The premises of the offices were not really impressive. Starting from the building's entrances, to the lobbies of the floors on which S1's had its offices. On one of the various floors of the offices there would be a receptionist who handled the

visitors and all phones. The receptionist also handled other sundry jobs like contacting the travel agents etc.

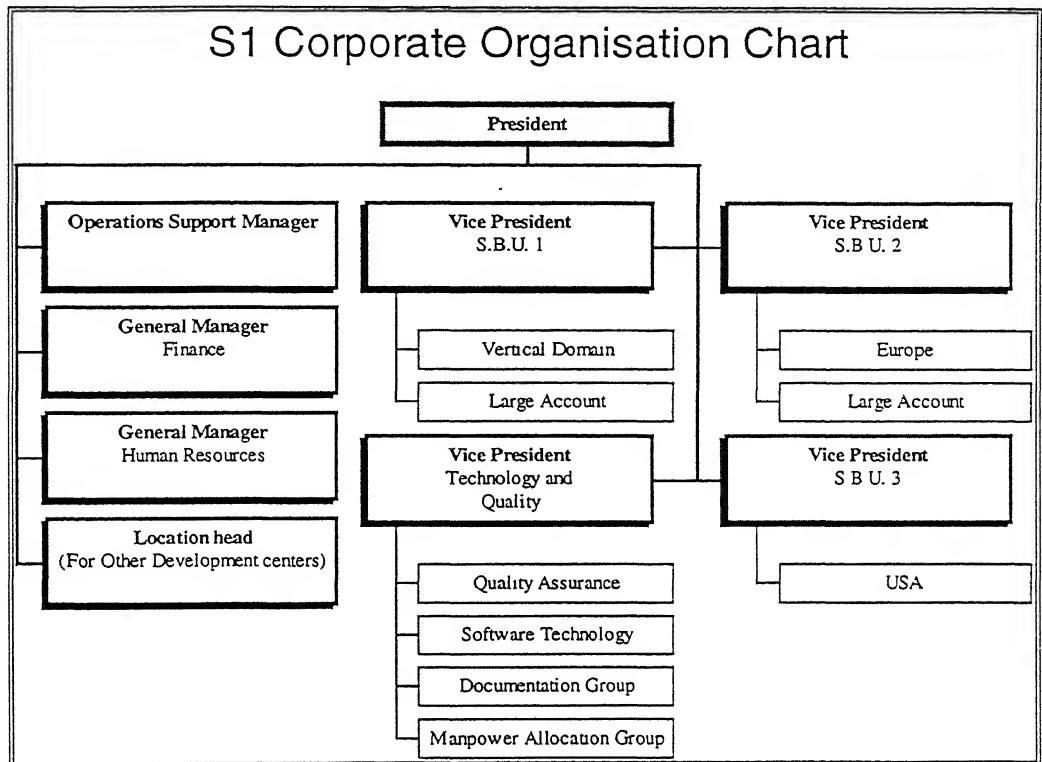
5.1.1.5 Organization of S1

The vice-president of SBU 1 explained about the organization of S1 (See

.Figure 5-1). He explained the available ways of grouping as per the businesses in which S1 was involved.

1. Technology : in terms of Mainframes, objects, system software and application software.
2. Market wise
Geography: Europe, USA, Far-East.
Vertical Domain: Finance, manufacturing, service, and health care.
Large accounts.
1. Functional : Human Resources, Finance, Operations Support.

He said that they have reorganized recently to be more customer focused. But they have almost all of the above groupings at the corporate level. The SBU's are market



.Figure 5-1 S1 Corporate Organization Chart

based. “The functional (Human Resource Management, Finance etc.) and technology divisions are central resources. Our policy is to go for greater market share in the long term. With a customer focused, resource constrained organization”.

The division of work to the SBU's is based on the size, operational area, and the experience of the SBU Head.

5.1.1.5.1 Development Group Structure:

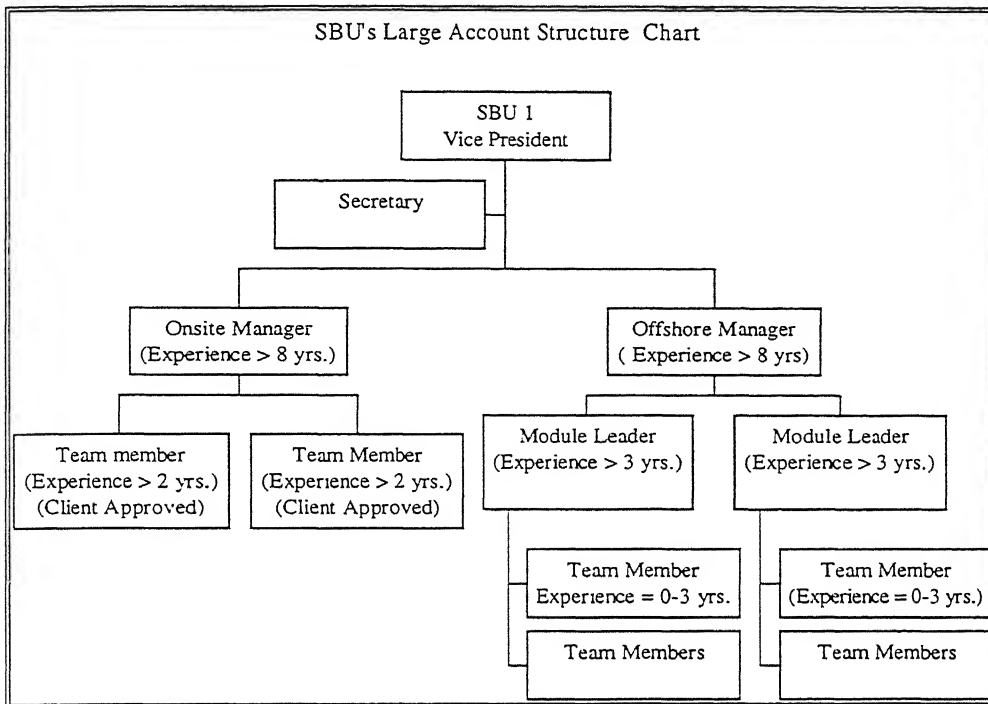


Figure 5-2 S1 Large Account Structure

The offshore manager explained about the structure in one large account inside the SBU 1. The functional structure of this account is shown in the Figure 5-2. He mentioned that he was able to give so much time as currently the client was in the planning phase and “business is rather slack nowadays. The client’s business cycles drive our work cycle”. He himself had 12 years of total experience in the industry and had been in the current position since the last one and half years. This account had about 100 dedicated people— 75 offshore and 25 onsite. The offshore work was mainly maintenance, and new development. There was only about 20% analysis work done by S1.

He mentioned that the other SBU’s had similar structure in terms of offshore and onsite managers etc. “*The actual organization of the project team depends on the size and nature of the project*” (An oft repeated statement through out the study). He said

that some of the Module leaders were handling 2 projects with one or two persons in each. There were projects where there were 2-3 Module leaders under the supervision of a Project leader who in turn reported to the offshore manager.

In case of insufficient people within the account, members as necessary were requested from the central Manpower Allocation Group. This group has the full information about the manpower requirements and availability status company-wide and shift's manpower or requisitions Human Resource Management group to recruit new ones.

The onsite manager is supposed to look after business development with the client, handle potential problems, and manage the onsite group. He is a person with at least 8 years of development experience. The onsite team member is actually working for the Project leader of the client. All the team members assigned onsite only after the client has approved them. And their client's comments have a large role to play in career progression.

The offshore teams are organized in the same manner as the client's organization. In this case, the client has functionally organized its software teams, and this is reflected in the offshore team organizations. There are 8 dedicated teams according to domain. An example was given where the onshore team is called the finance team, and worked solely on developing financial software for the client.

Work Discretion: The outputs of the team members are fixed with respect to time and task work. The member is free in deciding actual solution(algorithm) of the problem. The members are rotated to a different area (project), typically after 18 months. The

assignments depend on the qualifications. The assignments tend to be among the project groups within the account.

The offshore manager gets support from the central services like Human Resource Management, Operations Support, Administration etc.

Later the deputy of the above offshore manager was interviewed

He was called Module leader, alternately as the Process leader. He looked after the marketing of one client project and looked after the logistics of another project. He also served as the Backup or Deputy Account Manager in the absence of the Offshore manager.

He has technical responsibilities as to the planning, monitoring and developing the modules assigned to him on time and with acceptable quality. He often sits in the reviews with the clients for the projects or the planning stages of the modules.

He had the following points to make about the hierarchy of the company and the job rotation.

Promotion is more in terms of financial incentives.

One's designation changes, but not necessarily the work content. He showed the designation hierarchy of S1 (see Figure 5-3). This was not the latest formal hierarchy after the reorganization. This is different & varies from the SBU organizational chart as that chart emphasis the role to be carried out. General Manager upwards, the work is more administrative—planning, budgeting, promotions, etc. then development related.

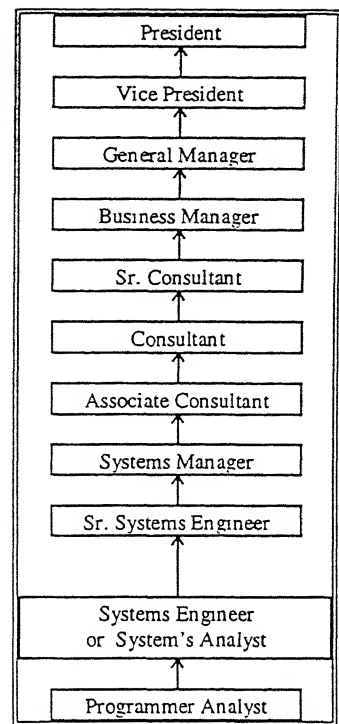


Figure 5-3 S1 Designation Hierarchy

“The client is possessive of the project team members, and rotations are not easily approved.” He said that such large account clients have a large say in the manning of the teams.

The quality control and assurance group is under the Vice President, Technology and Quality. This group was found to be manned by only 3 people dedicatedly. Also, these 3 people were there on a rotational basis for about 2 years. That for the span of their posting, they were to handle only the quality aspects of the company. They managed the quality training to be done, they looked after the process of acquiring and maintaining the ISO certification etc. The current person handling the quality group said that most of the quality nitty-gritty was handled within the development groups by the Quality coordinators. These coordinators did not belong to the quality group, but were some persons from other projects. “We are only facilitators”. The primary

responsibility seemed to keep track of the revisions and releases of the quality manuals. The Human Resource Management group, the finance group, the administrative groups, the operations support groups were all organized in a 2-3 tier hierarchy. Horizontally, each of the groups had about 3 or more specialization's.

5.1.1.6 Size

At the time of the data collection, S1 was about 1300 person strong.

- The Human Resources Department group was under severe pressure at the time of the visit. There were just about 4 people looking after the Human Resource Management affairs. There were supposed to be about 8 people. The finance group totaled about 15 persons. The operations support group looked after the infrastructure and administrative needs of the organization. These include the receptionists, the secretaries, the network maintenance, purchases etc. These were about 100 people at the most. The Quality group incharge said that there were only 3 people, on a rotational basis. The technical division was estimated at about 100 people.
- The rest of the personnel were in the SBU's. These were the people involved in providing the service and software development. Among these, there were different groups varying in size. For example the large account group visited, had about 100 people. There were accounts with just 5 people.

5.1.1.7 Summary

- S1 shows very few people in specific marketing assignments and in the support groups.

S1 shows a dynamic structure in the development groups. That is there is no fixed assignments except the project roles that are for the duration of the project. The role of the project leader could be taken up by any competent fellow with whatever designation

Hierarchy in designations does not reflect into much changed responsibilities in the development groups. Depending on the projects, the roles played by the same person can change. They are grouped on the basis of clients within the SBU. And within the client groups, they follow the clients structures in the large accounts or according to the size and number of modules to made in the project. The other support departments show more definite structures. They also have more fixed work responsibilities.

The organization was overwhelmingly populated by the development involved tasks. It is a huge organization and bureauractic to a certain extent

5.1.2 The Company S2

5.1.2.1 Introduction

S2 is the software development division of a joint venture information technology company. The primaries are an Indian business house and an a multinational information technology giant. The joint venture has interests across the information technology spectrum. For example, it has a software product division that market's the multinational's products in India. S2 offers development and support services on a wide variety of platforms, particularly IBM mainframes. It provides systems integration, application development, conversion/migration and software support

projects. The head of S2 was from the foreign parent. The revenues were around Rs. 30 Crores.

5.1.2.2 Market & Strategy

According to the vice-president, who headed S2, the primary customer of S2 was the multinational parent abroad. S2 was only recently setup and was planning for a major ramp-up of its service operations at the time of the visit. S2 was going in for more diverse customers than just the parent affiliate. Both abroad and domestically. Generally, the senior managers of the development groups and the VP decided how to grow the business.

5.1.2.3 Impressions

There seemed to be some problems among the top executives. The investigator was kept shunting between with each saying the other was available. By the time of this writing, the two have gone separate ways. And S2 is undergoing a tough time. A number of employees have left the firm, including a lot of people at the top. And its expansion plans are currently on hold. Given the visible lack of cohesion among the person visited,, the investigator was not surprised at the downturn.

S2 has its offices dispersed in 2 places in its home city, with one of the above mentioned executives at each of the sites. It was planning to open another development center in another town. The building visited housed the office of the VP of S2, the HQ, and also, one of the development centers. S2 had a dress code, generally along the lines of its foreign parent's traditions. The premises of the offices could be called "swank". The security was noticeable. The entrance had electronic security systems.

5.1.2.4 Organization

The corporate organization of S2 is based on a mix of market and technology (see. Figure 5-4). The clients from the parent's divisions, come to them mostly based on the technology skills they seek. According to the Vice President, the team members are

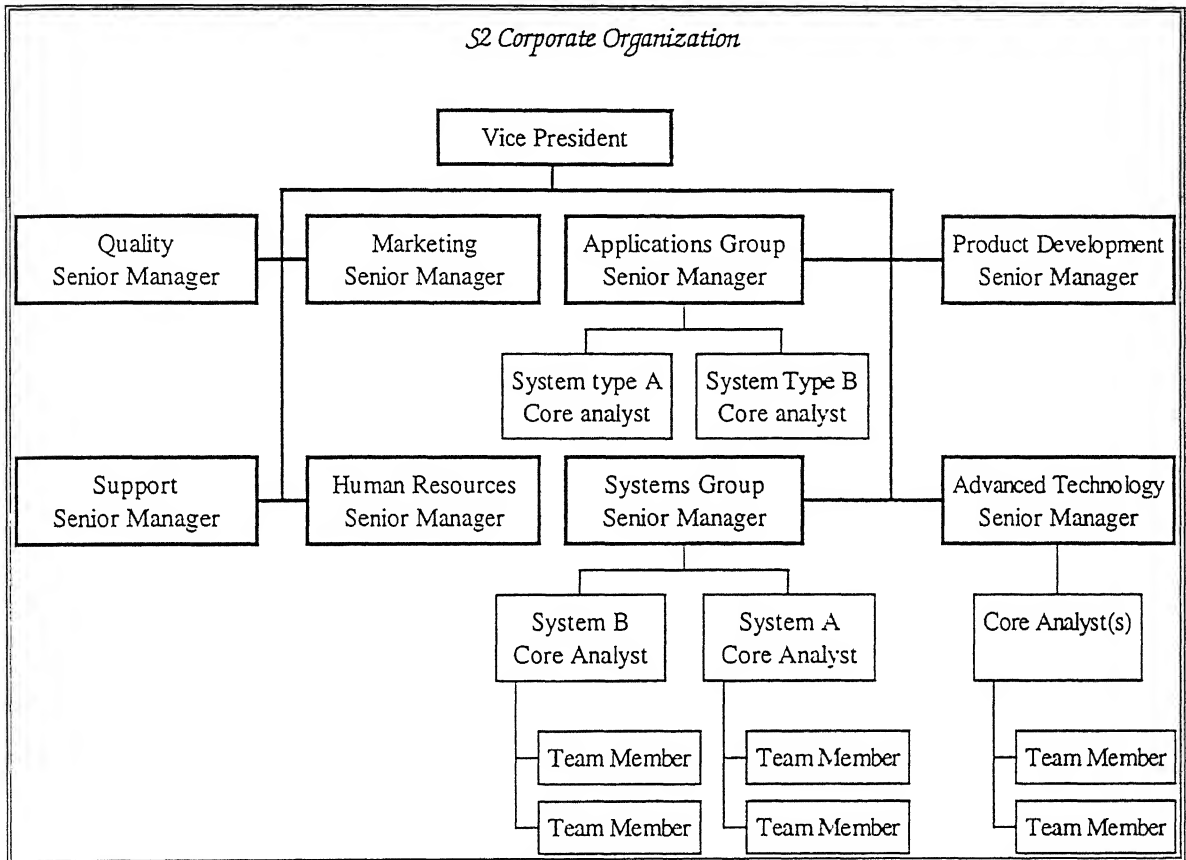


Figure 5-4 S2 Corporate Organization

not really fixed in a particular group. They are moved as the need arises. The core analysts remain with their respective groups always. They actively head the projects or for bigger projects, work under more senior managers. There are 12 people dedicated in quality.

The marketing department is split, according to customer set or geographical basis, about 2-3 people per section. These are account managers who manage the back office

once the projects come in from the customers. These account managers are technically competent. With about at least 4-6 years experience in development

The functional groups like support departments like Human Resource Management and finance had stable, definite, 2-3 level hierarchy. The Human Resource Management group was split into recruitment + Personnel, and the training group.

5.1.2.4.1 Development Group Structure

The development groups are organized according to the technology focus of the clients. All the groups internally are organized around Core analysts. These are like the project managers or leaders in other firms. There is a group head in charge of the development group. Below him are several core analysts. There are team members under the supervision of the core analysts. According to the size and nature of the project, the senior team members could be playing the role of module leaders.

The core analysts are specifically attached to their respective development group. These have had more than 4 years of experience. The team members are freely allocated to the departments as the need arises. These have had less than 3 years of experience. The quality groups help coordinate quality activities, but the review teams are from within the development group.

5.1.2.5 Size

S2 at the time of the data collection, was about 400 people strong. The marketing department had about 12 people. The finance and Human Resource Management had about 20 people. The Operations Support group had about 10 people. The quality group had about 12 people. The rest of the personnel were in the development groups.

5.1.2.6 Summary

S2 has a functional marketing team. It shows very few people in marketing, and functional services. S2 has fixed structures in the functional groups of Human Resource Management, Finance, etc. The development groups are one pool from which people are allocated to which ever project requires them. The overwhelming majority of the personnel are development personnel.

5.1.3 The Company S3

5.1.3.1 Introduction

S3 is a public limited company incorporated in India, with over 38,000 shareholders. A foreign body has an equity stake in S3. S3 is part of “India’s leading multi-million dollar global export group which has interests in IT, Engineering, Agro-chemicals, petro-chemicals and infrastructure projects” with presence in USA, Europe, Singapore, etc. S3 does conversion/Migration, downsizing, Software Re-engineering, software maintenance, applications development. It also has some agency operations to provide training for a foreign software product. S3 has shown spectacular growth since its very recent inception. S3 showed revenues of more than Rs. 60 Crores in 1995-96.

5.1.3.2 Market & Strategy

S3 has executed more than 40 offshore projects for clients such as Singapore Telcom, AT&T NEC, etc. S3 will remain a service provider in the near future. It soon plans to establish 2 more development centers in different cities in India. It helped some clients establish virtual software factories.

It is venturing into new areas like multimedia, telcom applications. Its traditional area is in manufacturing applications. Their senior people have had experience in these areas

and they built upon it. The senior development managers and the CEO, and the VP set the strategies. Some of the managers say that a change towards products is imminent. They already have agency operations to market some products. They have some product like tools developed which are under limited use within the company itself.

5.1.3.3 Impressions

S3 was most helpful in conducting the visit. There was a very professional air in all the transactions that occurred with every one. At the time of the study, S3 had one development center which also housed the administrative offices. It was the only service firm with all its facilities in one physical place. They had a company canteen on the premises. Every one from the CEO to the newest member and guests had their lunch there. There was a strict dress code similar to the other service companies, i.e.

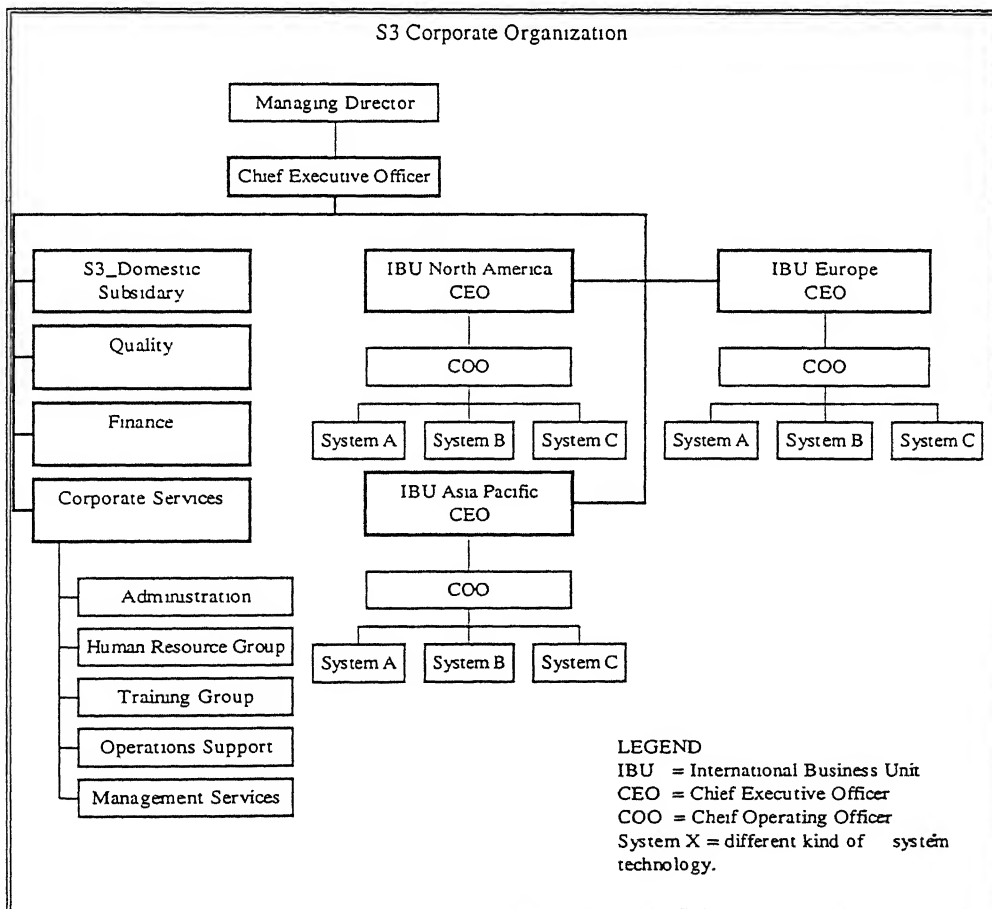


Figure 5-5 S3 Corporate Organization

the light colored sober full sleeves' shirts and ties for the gentlemen. Saris or salwar kameez for the ladies. The premises, from the entrance inwards to individual desks were immaculately kept. There was a high technology security arrangement consisting of computerized time checking and video cameras at the receptions. Even the security guards had to be absolutely neat in their appearance and behavior. Except at the floor leading to the CEO's office, all the other floors, the security handled the reception desk. He did not handle incoming or outgoing telephones. But visitors were courteously seated in a well maintained lobby, while the person to be contacted was called outside. The overall impression was of competent efficiency.

5.1.3.4 Organization

Its organization structure is as in Figure 5-5. S3 is an export oriented unit and it created a subsidiary (S3_subsidary in the figure) solely for the domestic market. This is essentially agency operations to market products in India.

The International Business Unit (IBU) are incorporated companies in the geographical

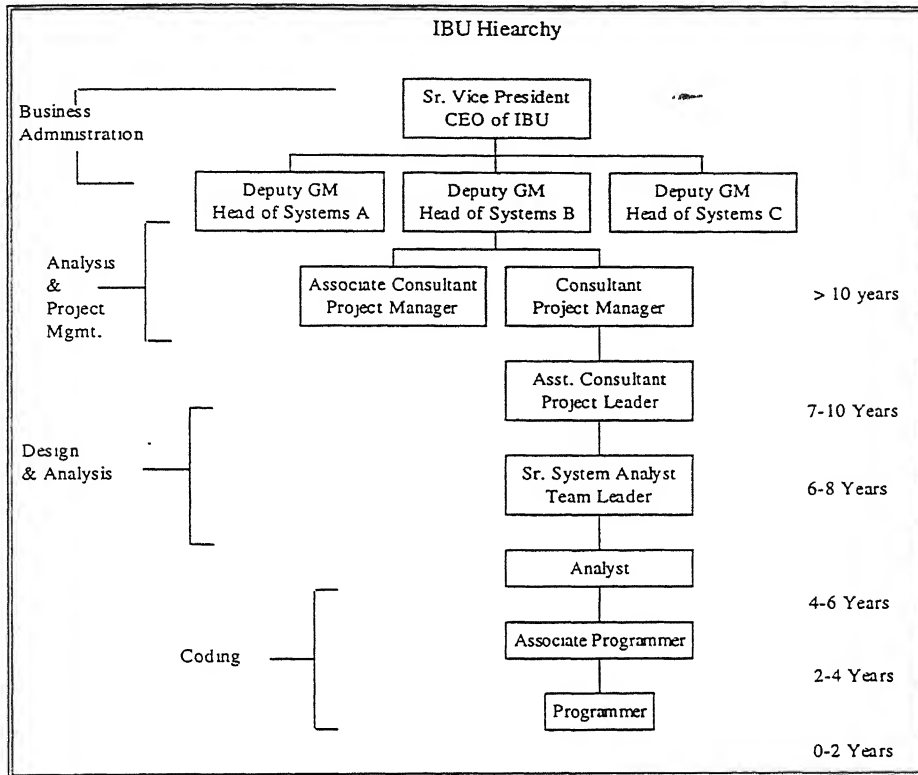


Figure 5-6 S3 IBU Hierarchy

sphere of operations. The primary function of the company operations abroad is marketing and onsite project coordination. The IBU were earlier called the sales offices. There are about 3-5 people at each of these offices. According to the vice-president, head of Corporate Service, totally, there are 10 people doing the marketing functions. All of these have been developers at some time or the other. These are also senior people as they have to coordinate the onsite developers.

The Deputy General Manager, Projects explained about the difference between what he repeatedly clarified is the "Administrative chart" (See Figure 5-6) and the project structure. The former gives the designations and reflects seniority. The project structure defines the roles.

5.1.3.4.1 Development Group Structure:

The project structure is as in Figure 5-7. The project structure is flexible, depending on the size of the project. There could be just a team member and a designated project manager in a project. This project structure is different for projects that do maintenance work. Such maintenance projects are about 30% of the business and are not ISO certified.

Except the quality facilitator, the rest of the teams is dedicated for the duration of the

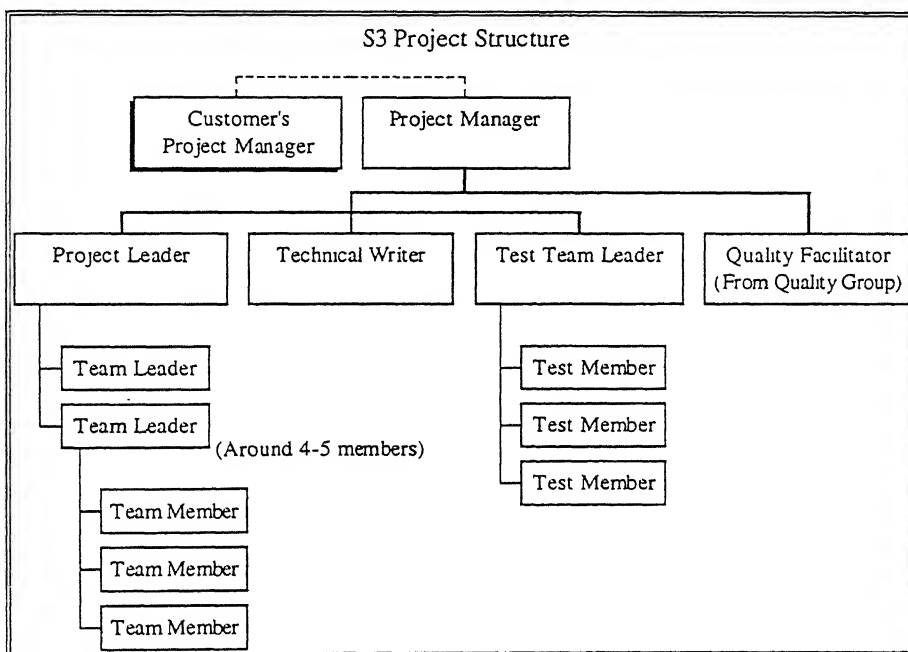


Figure 5-7 S3 Project Structure

project. That means that the quality facilitator can be a facilitator for many projects simultaneously. The technical writers are specialists in technical documentation. These also could be part of different projects, if they are small (less work load). The team members are chosen from the pool with the Resource Management Group, who “owns” the team members till the rank of associate Consultants. There is another group called the Project managers Group, which “owns” the senior personnel. The team members undergo training when unassigned to a project. Generally the team members are allotted to projects according to the systems division. But occasionally

projects arise that need to be filled in from other divisions. Hence attempts are made to multi-skill the team members so that they can be assigned irrespective of division they belong to. The team members also could be assigned across IBU as of now. When the reorganization and the expansion process is finished, then there ought to be little transfers across the IBU (presumably by then the IBU's will have been able to hire enough personnel and become self sufficient. Till then the personnel will be shared).

5.1.3.5 Size

At the time of the study, the firm had a strength of over 600 people.

1. The Vice President further informed that the company has 452 technical personnel, 75 fresh recruits, and the remainder are in support services. The quality function has always a dedicated strength numbering about 13, including some developers "loaned" to quality.
2. Administration has a strength of 9 in a two tier hierarchy. The Third & lowest hierarchy level people are all hired on contract basis. These amount to 12 people on contract basis. The Human Resource Management has 8 people in a 3 tier hierarchy, starting from a Senior Manager. The training group has 5 people in a 2 tier hierarchy under a senior manager. There is an R&D group that has 88 people. They are arranged as per the technical area. The support groups do not have shifting working arrangements like in the development groups. Nor are these other groups very big.

5.1.3.6 Summary

S3 shows a flexible structure in the development groups, very few marketing personnel, and small support groups. The majority of the employees are in

development oriented jobs. The designation hierarchy is not related to the work responsibilities, which may not change though the person may have a higher designation. The Human Resource Management and the training function are separated here. The supporting functional groups have fixed responsibilities. This company is unique from other service companies in that it has specialist technical writer.

5.2 The Company PS1

5.2.1.1.1 Introduction

PS1 is a publicly owned company. It is a software projects and products company providing professional service in various parts of the world and domestically in India. PS1 strength is in developing and implementing GUI and RDBMS based client server applications. PS1 is a company in the process of shifting focus from projects and services to packaged software. It had revenues over Rs. 40 Crores in 1995-96. The company is proud of its relatively big investment in its R&D.

5.2.2 Markets & Strategy

PS1 implements projects around the world and in India as well. PS1 does :

- Customized projects for exports & domestic operations.
- Professional services for onsite.
- Development, marketing and support of its own products. Particularly in financial areas and manufacturing.
- Marketing and support of agency products.

The company was a pure service provider until recently. Now the firm has an explicitly stated intent to move into the products development and marketing. It puts in about

12% of its revenues into product development and R&D. The founders of the firm essentially decide the strategies. The decisions as to which projects should be undertaken or not depends on the senior development managers & the CEO within the SBU.

5.2.3 Impressions

The head office of the company are within the surroundings of an export processing zone. The office premises gave a well maintained neat look to it. In the same city, there was another set of offices outside the zone. These handled the domestic operations and were in sharp contrast to the head office. PS1 has a dress code, relaxed on weekends. The employees were extremely cooperative in assisting in the study.

5.2.4 Organization

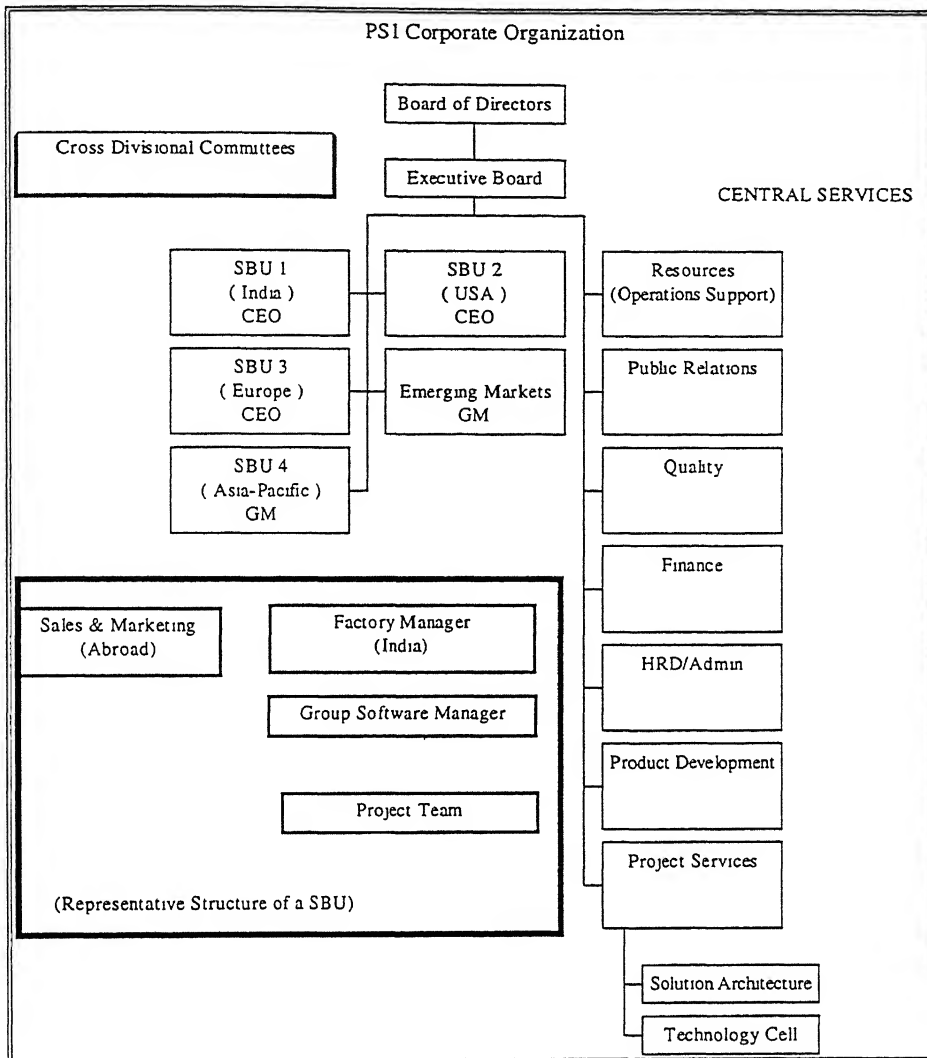


Figure 5-8 PSI Corporate Structure

PSI underwent a reorganization recently after which it is now reorganized into “a federation of market-based SBU’s”, supported by central services (See figure Figure 5-8). The idea is to be able to better address the needs of the customers in the countries of operations and to keep the feel of a Small company under the larger umbrella.

PS1 has about 8 full marketing offices in India. It has subsidiaries abroad. It has development centers in 2 metro cities and a dedicated R&D development center in another city.

The SBU's for areas abroad are incorporated subsidiaries in the geographical area of operation. The SBU heads or the CEO's of the SBU are stationed there. PS1 has a local of that area as CEO in one of the SBU. The primary function of these offices is to get contracts for offshore development, get the short term contract programming assignments, and to coordinate and manage the onsite personnel. These SBU teams are

small in number. These people who primarily do marketing functions "need experience in IT, so that they can understand the client's requirements" informed one of the marketing executives. This person himself had about 8 years of development experience. The country manager (exports) for one of the SBU's talked of his job as providing "support to the front end", "back office work like coordinating estimate communications to the front end, providing them sales data, brochure etc." His experience in development was about 8 years.

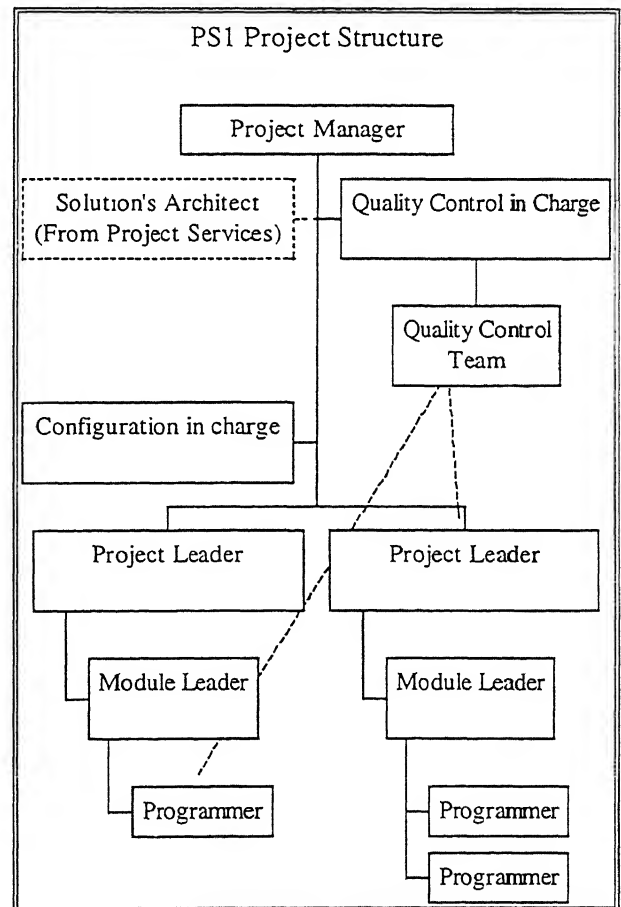


Figure 5-9 PS1 Project Structure in Service Operations

5.2.5 Development Group Structure

PS1 projects structures are flexible depending on the size of the project (see fig. Figure 5-9).

The Project Manager appoints the Quality Control-in-charge(QC), the Quality control team and a delivery coordinator, from amongst the project team itself. The QC is among the more experienced of the developers. This person, for the duration of the project is involved in this role. The QC team itself may be made from the developers among the different modules. they will be doing dual tasks of development as well, when not called for the reviews. Similarly, the module leader holds the dual responsibility to develop the user and technical manuals. The developers are assigned from the “bench” or “float”, that is the unassigned developers, and from projects that are almost complete. Till the resources of the SBU’s grow, the SBU’s share all the facilities. They are expected to develop their own facilities. Then, each will have their set of “float”. Thus, only for some time, the developers would continue to be assigned for offshore projects to any of the SBU’s irrespective of their parent SBU (A situation similar to S3). The kind of project they are assigned depends on their experience, training and the needs of the project. When not on projects, they are supposed to be training.

5.2.6 Size

The company has a strength of over 700 people. Of the over 700 people in PS1, over 100 are on assignments abroad at major multinationals. Totally, there are over 475 qualified technical personnel.

Its Indian operations are by far the biggest of all its other operations, in terms of number of people. The Indian SBU is about 275 people. The Indian operation has an intricate organization. A major component of its force is made of marketing and support for its product operations. This amounts to about 150 people. There are about 40 people providing support services to the units of this SBU. Most of which provide administrative support to the field teams.

PS1's Central Corporate Service groups total to 44 people. This includes a handful of people in the very recently formed Project Services group, some of which are technical people. These support the Foreign market SBU's.

The other support departments like finance, quality, human resources department/Admin. have more definite working arrangements. They are also less required to perform multiple duties. They also are arranged in a 2-3 level hierarchy. They are very small in number e.g. Quality, under a GM is planned to have only 3 dedicated people. Each of the three has a specific and fixed role to perform.

5.2.7 Product Organization

The product development center had an organization totally distinct from the rest of the development groups. The development groups of the SBU's had no other fixed divisions or groupings besides their SBU. The product development teams were organized on the basis of the products developed (see Figure 5-10). The size of the application development teams was very variable. Sometimes they were sent out for product support. Or were engaged in maintenance of earlier versions. The testing groups were smaller and almost constant in size. The persons here were not needed to

provide support for the product and stayed at the center. There was rarely any cross over between the testing groups and the development groups.

There were 4 people from central services to provide support to the development center. The quality guidelines were followed during development and the testing teams were to ensure a higher level of quality requirements that are a must for products

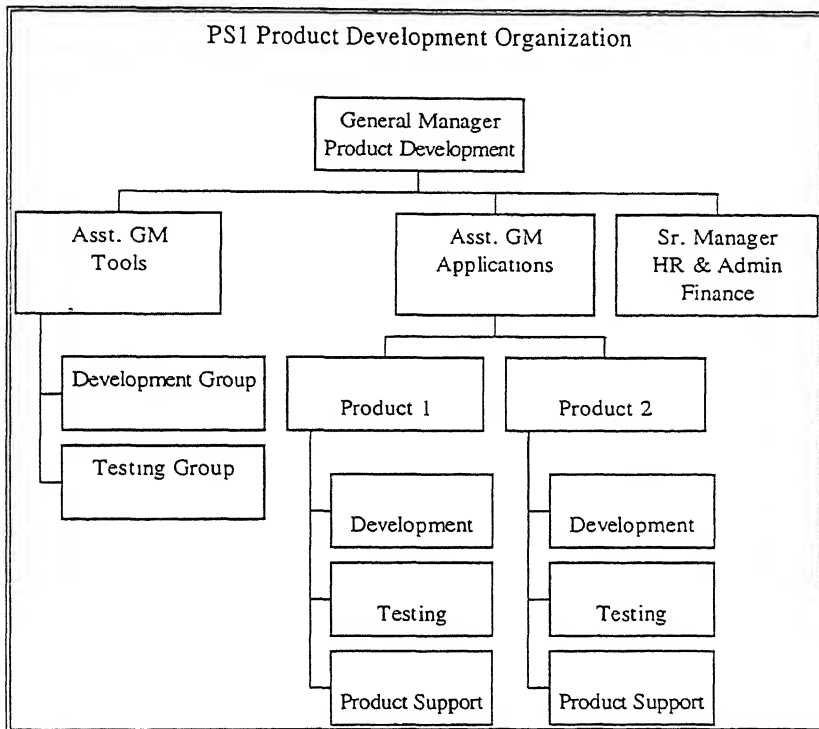


Figure 5-10 PS1 Product Development Structure

informed the GM, Product Development.

The development of the product was carried out as a project. The structure of this team was very different. See fig Figure 5-11 The importance of testing and review is obvious. The primary reason for this is the greater need for quality in products, informed the GM.

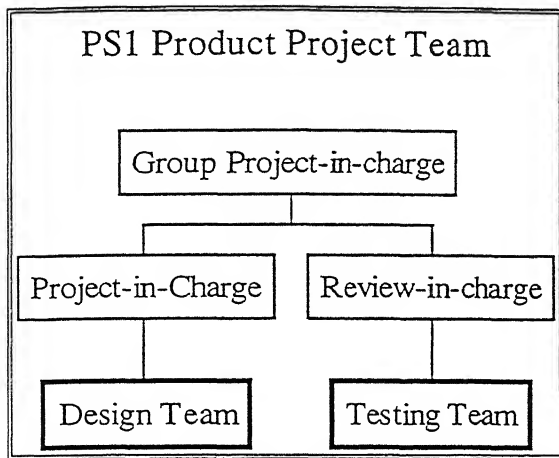


Figure 5-11 PS1 Product Project Structure

5.2.8 Summary

PS1 shows great differences in its Service oriented organization and in the product oriented organization. While the service wings show flexible organizational arrangements that vary as per the projects in hand, the product operations

have stable organizations around the products developed. The product development organization has specific testing teams that are separated from the development teams. In their service operations, the reviewer is doing developmental work as well.

- The functional support groups have fixed work and a stable hierarchy.
- The Ratio of the personnel doing market related activity in the Indian SBU is dramatically different from the export oriented SBU. This is a direct reflection of the primarily product orientation of the Indian SBU.

5.3 The Product Companies.

5.3.1 The Company P1.

5.3.1.1 Introduction

P1 is a single product, privately held company. The company had revenues of over Rs. 10 Crores in 1995-96.

5.3.1.2 Markets & Strategy

The product is an accounts and finances management software. The Indian domestic market is awash with similar products but this product had some innovative features

that made it very popular. It has been bought by a wide spectrum of businesses from multinational companies, big corporate houses, to smaller retail shops, small scale sector companies, etc. It has sold over 7000 copies and even is being exported to the Middle East and the South Asia.

The Chairman and Managing director set the strategy. They are committed to its product. It will continue to enhance it to match its market's requirements. They have no intentions of diversifying into related products. According to the trade literature P1 had plans to set up a subsidiary company to take up the marketing of the product.

5.3.1.3 Impressions

The branch office coordinators, the administrator, the dealer manager, all seemed to have a lot freedom to carry out their duties. There seemed to absolutely no dress code. The people were well dressed, but not appearing really formal. Some employees, who normally were not required to attend field calls, were less formal. They sometimes made small forays for documents, barefoot. The offices had a well maintained, sober look to them. The office was in a very up-market mall type location.

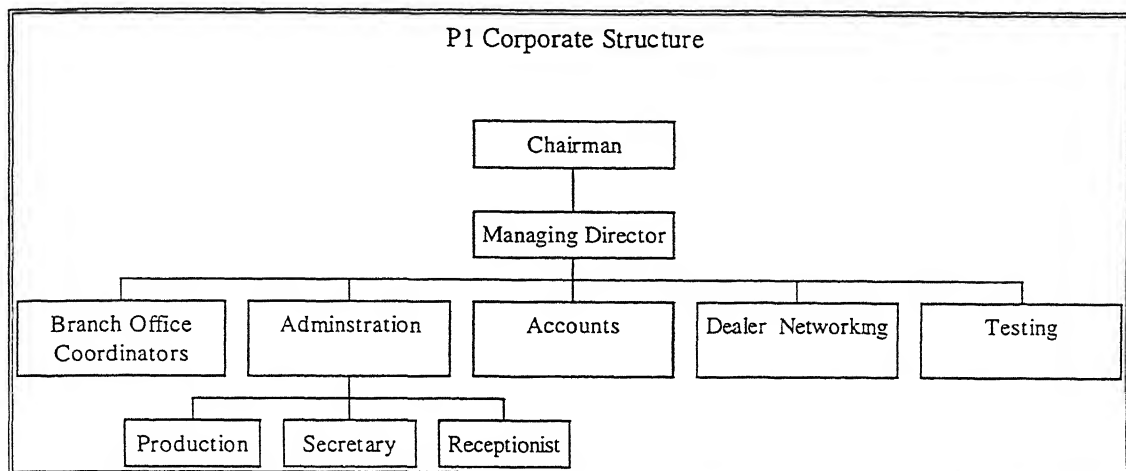


Figure 5-12 P1 Corporate Structure

5.3.1.4 Organization

The company is a family concern. A Chairman heads it's structure (see figure Figure 5-12). As a policy, the company has no designations at all. "Yeh mera kaam nahi hai, Aisa, kisine nahi kahna chahiye" (No one should be able to say, that this is not my work)" said the Chairman. "Saab ko saab kaam karna hai" (Everybody has to do all kinds of work) he elaborated. Therefore, the company has no official organizational structure. The figure is constructed by the investigator. The effective structure is flat--everybody reports to the Chariman for all matters except technical. The chairman was kept informed about all decisions taken. The person handling the administration had been in the company since its inception. And he reiterated this view of no positions and designations, except for the accounts section. He also said that every body did whatever the work was to be done. This is the view from the top management.

The impression gathered from the employees is different. Every employee seems to have a primary work assignment and secondary assignments. One of the members contacted said that his primary work is to look after the dealership network. The secretary mostly handled the files pertaining to the purchases. The production handled

the copying and dispatch of the physical package. The receptionist handled calls and all the communication requirements such as fax, keeping track of who is where and making travel arrangements, etc. She also provided customer service if she was free. The person the investigator labels as 'Administration' seemed the only person without any explicit primary functional responsibility yet seemed to be attending to all small conflict resolutions and gave commands. This person also seemed to handling a lot of calls from outside regarding matters that pertained to the running of the company. For example, there was a call regarding a new computer to be installed, this person handled the negotiations; there was something about the deliveries of floppies for the packaging, something regarding the buildings at a branch office, etc. The branch office coordinators also seemed to describe their work and view themselves as branch office coordinators, inspite of no designations. That is there was a great deal of division of work duties. Their secondary duties generally meant answering customer queries.

The most frequent activity seen at the office was handling the customer queries. Everyone at the office seemed to handle the customer calls. The receptionist could do it, but if busy, the call was passed on to any one free to take it. This included the Chairman, except the 3 people in accounts and the 2 in production. The investigator was informed that they also were fully capable and trained to take customer calls if the load is too great. But generally they were not required to do so.

The only work divisions that officially were acknowledged was the accounts, the production and the titles of Chairman and Managing Director. No one else had any designations, including the people in accounts.

Every body seemed to report to the Chairman and only for real technical difficulties or training duties or legal matters was it that the managing director seemed to be required. All the day to day management was handled by the 'Administrator' and the Chairman. Every body said that they reported to the Chairman.

The company had branch offices in 2 other parts of the home city. These were run by the branch office coordinators. They looked after everything there, from management, customer service, day to day matters dealing with the administration of the site etc. All the records of the transactions were forwarded and kept with the Head office. The company had two outstation employees. These were in different metropolitan cities and handled all the market development for those regions. They also reported to the chairman every evening by phone.

5.3.1.4.1 Development

The managing director alone seemed to do all the development, made the manuals and gave the initial training to the dealers, company personnel for the new releases of the product. There were 2 people whose primary task was testing and quality assurance. They tested the product thoroughly, before it was released. They also were the first ones to learn the product and aid the MD in training the others. The most difficult queries from the customer were handled by these people. There was no one else in the firm besides, the MD and the 2 testing persons who was involved in the development related tasks of the product.

5.3.1.5 Size

According to the branch office coordinator, the company strength was around 30, the dealer coordinator thought it to be near 50. The 'administrator' and the chairman

agreed it was around 25. The company has about 25-50 employees (depending on who was giving the figure). There may be a legal subsidiary formed to do most of the marketing of the product but whose operations may have been integrated with the operations of the parent company (Dataquest,1995 pg.165). This could be the reason for the discrepancy in the figures.

5.3.1.6 Summary

P1 depicts an emphasis on marketing of the product in its organization. Everybody provides customer service. Except for that, every body's work is specialized.

The development work is all carried out by the MD, but there are specific people to carry out the testing function.

5.3.2 The Company P2

5.3.2.1 Introduction

P2 is a division of P2 industries. This company is part of a respected, diversified, more than Rs. 600 Crore business house. The business house is into yarn, cement, electronics, etc. P2 is expected be hived off as an independent company soon. P2 is into high-end segment of software generically called as enterprise resource planning systems. P2 also sells some datacom related products. It's major product is its offering for the enterprise resource planning systems market. It achieved sales of around Rs. 10 Crores in the year 1994-95.

5.3.2.2 Markets and Strategy

P2 develops and markets its own products worldwide. It has subsidiaries in its major markets of North America, Europe and the Asia Pacific to sell and support its

products. It has over 25 sites already established world-wide. The customers are primarily large manufacturing firms.

A 'Apex Board' of all departmental heads and the CEO form the strategy making body. The company is committed to its ERP product. It will continue to enhance it and improve its technology. There are plans to make products that cater to the entire enterprise.

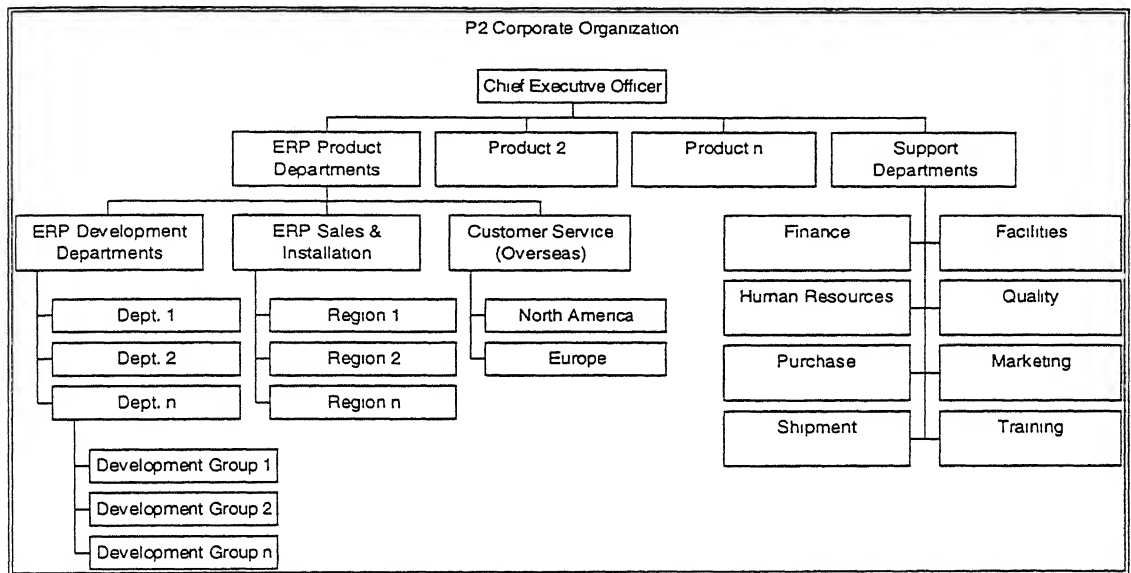


Figure 5-13 P2 Corporate Structure

5.3.2.3 Impressions

The offices of the firm were very spread out. The head offices and one or two development groups were in one building, the other development groups were dispersed in 3-4 other scattered buildings. Some of the other buildings were visited during the visit. All of the sites had a very functional & comfortable look. They were not badly kept, but they also did not have expensive furnishings, floorings, etc. There was a dress code. Particularly, the sales staff had to follow it more strictly. The offices did not have a frenzied air that the other firms seemed to have. The technical service

desks showed a greater lack of time. The product teams seemed have complete freedom as to their products.

5.3.2.4 Size

Currently the company has a strength of around 700 people. Out of this, about 150 persons are involved in support activities like Human Resource Management, Finance, Facility, Training, etc. The quality group is about 10-15 people. The training group is about 15-20 strong. Human Resource Management is about 10.

About 200 persons are into sales, marketing and customer related activities like installation, queries etc. The Indian sales team is about 35 - 40 people while the installation team is about 100 people. The business analysts are about 35. The marketing & sales teams at the subsidiaries are not part of the above figures and are separate.

The remaining 350 odd persons are into the development activities of the various products. The firm is not dominated by the developmental personnel.

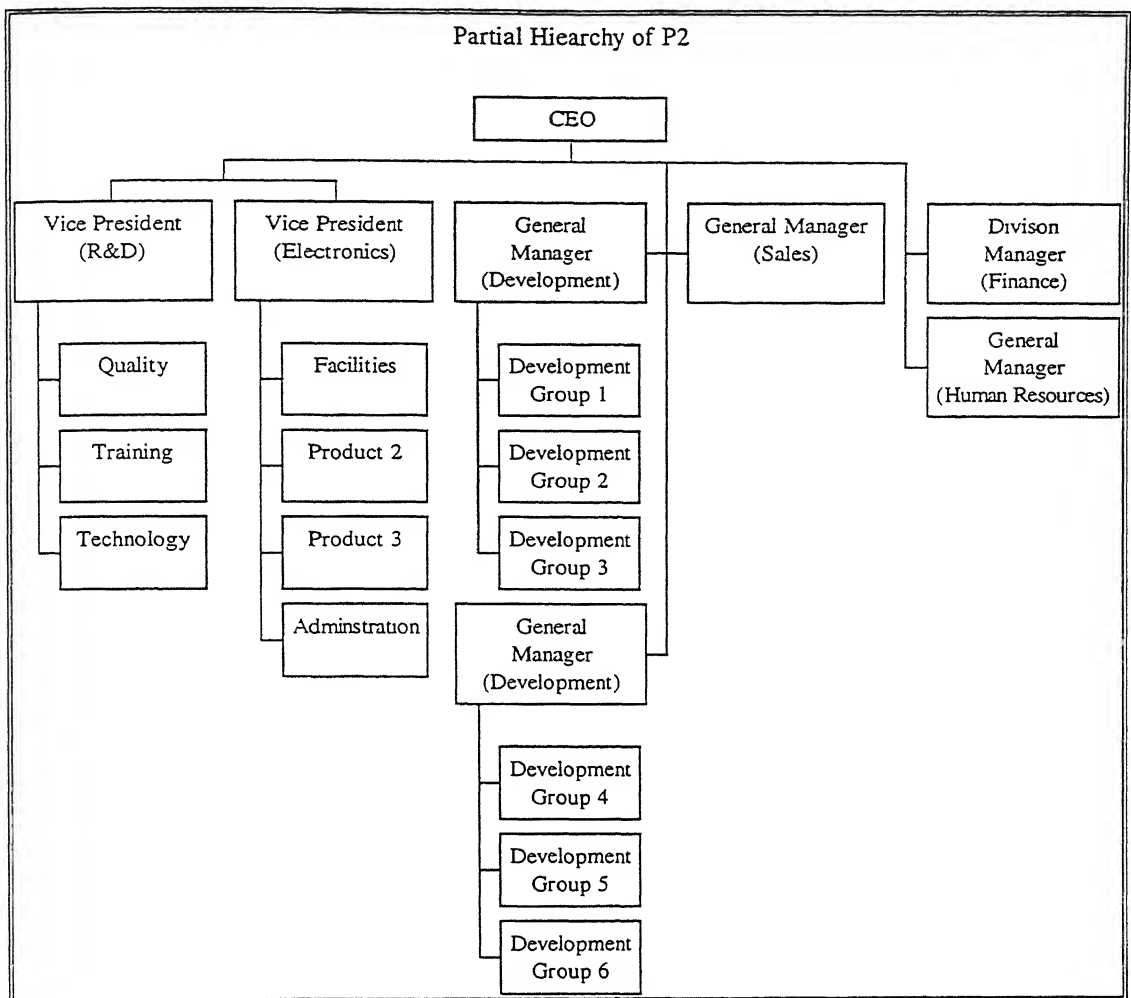


Figure 5-14 P2 Partial Hierarchy

5.3.2.5 Organization

P2 is viewed as a company organized around products. It consists of a set of departments, as shown in the figure Figure 5-13. The department heads report to the CEO. Figure Figure 5-14 shows the hierarchy. Each of the products is supposed to do its own development and sales. Out of the companies stable of products, the most important product is it's ERP product system. This is a large system. And thus an elaborate organization to handle its development, sales and support exists and makes up for most of the company's people. The other products are not so vast or complicated. Nor is the organization required to develop, sell and service those

products. The focus was on the ERP product that made up most of the organization. As can be seen, there are different teams that are involved in the sales and the development.

5.3.2.6 Development

The ERP product system has a number of modules, each of which can be sold as an individual product. Each of these modules has a group dedicated to its development and maintenance. Figure Figure 5-15 shows the organization of the product development departments. Each development department consists of many development groups. Each group, headed by a product head, works on one or more identified software projects. There may be more than one project associated with each product. For example, while a previous version is under maintenance, the next version would be under development. Each group generates the product requirements, develops the product, gets it accepted and carries out product maintenance, if applicable.

The product champion here gathers the requirements for the product, together with the

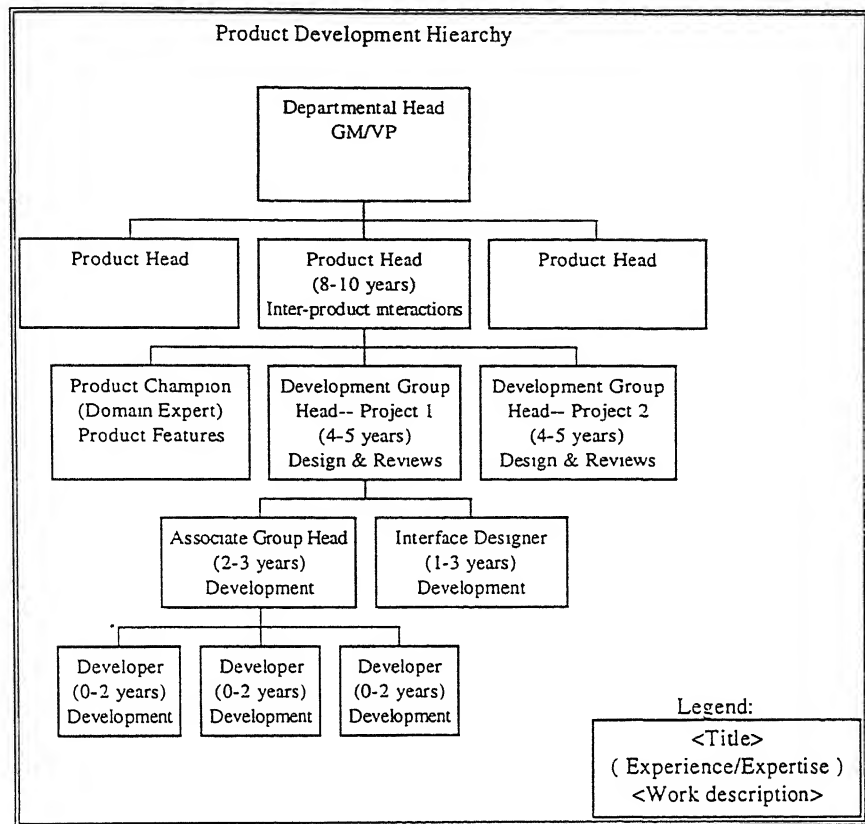


Figure 5-15 P2 Product Development Structure

product head. The development group then goes ahead with design and development of the product.

The size & nature of the product decides the size and breakdown of the team to make it. The sizes of the product teams vary. Once decided, there is little variation in the team structure or composition. The developers and other team members are encouraged to stay as long as possible with the product. Midway transfers to other products are discouraged. Some transfers are allowed if the developer has spend more than 2 years on the same module. In the new module, the developers take about a year before they start contributing to the product.

Even after the product is into sales the maintenance work goes on. When work on the next version starts, it is preferable that the people working on the earlier version are

available to work on this new version. The work content is fairly fixed and stable. The developers are never in touch with the customers. Technical specialization is encouraged.

At P2, the product's quality is in the hands of the product team itself. Under the guidance of the quality department, the quality functions are supervised by the product Champion and the product head. There is an external product audit team those checks for compliance's with the quality systems. Other wise, the programmers within the product group look after the reviews, low-level testing etc. External system level testing is carried out by a separate department.

5.3.2.7 Sales & Marketing

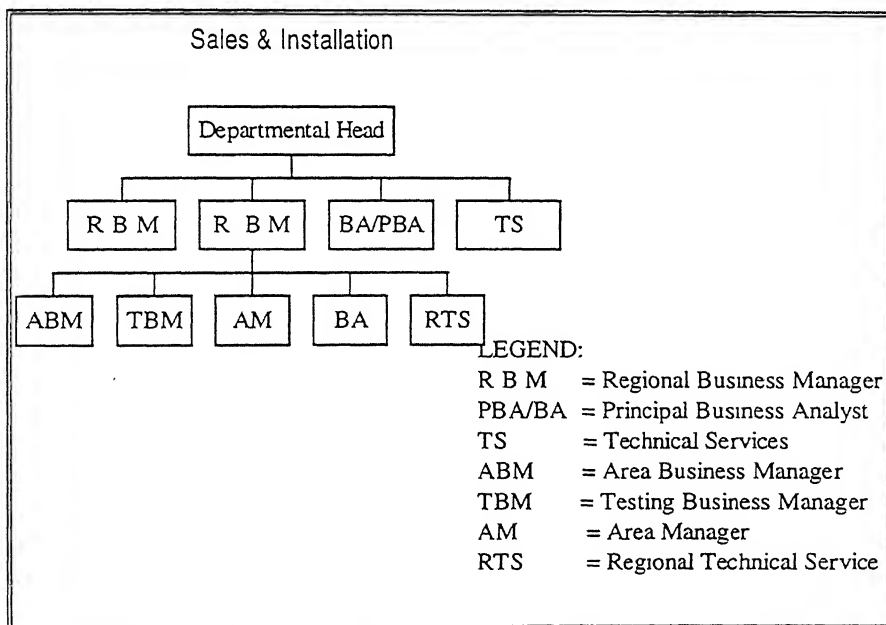


Figure 5-16 P2 Sales and Installation Structure

P2 has an elaborate and a distinct organizational setup to carry out the sales of the ERP product and its installation (see fig. Figure 5-16). The sales & implementation department is headed by a GM. The department carries out 2 functions. The sales function and the installation function. The Business Analysts and the Technical services

do the actual installation. The installation process is taken up as a project. The Business managers do the sales functions. There is a small amount of customization done to the ERP product which is done by the technical services, in a project mode with the Business analysts doing the requirements for the project. Thus these teams are fluid and short lived. They exist for the customization and then reform for the next assignment. The new team may or may not have any of the former members. There are subsidiaries abroad which look after the sales and implementations abroad. In India, the sales function are organized as per the geographical regions of the country—North, West etc. Each of the regions is to have its installation team. The team doing the sales and installation is totally different from those doing the product development.

There are special desks that are meant to handle customer queries. These are organized on the basis of the region they serve. The programmer in the product development never has to handle any customer query. The desk or the Technical services handle all customer complaints that arise.

5.3.2.8 Support functions

In P2, the customer training is handled by a separate Training department. This handles not only the internal technical training but also customer training. The Human Resource Management group takes care of recruitment and personnel. They also do non-technical training. These people have fixed stable tasks. The quality department does the standardization of the quality processes. The quality groups sends its members as key members of the external review and audit teams of the products. The support functions have elaborate 2-3 layered hierarchy such as the training (See fig. Figure 5-17).

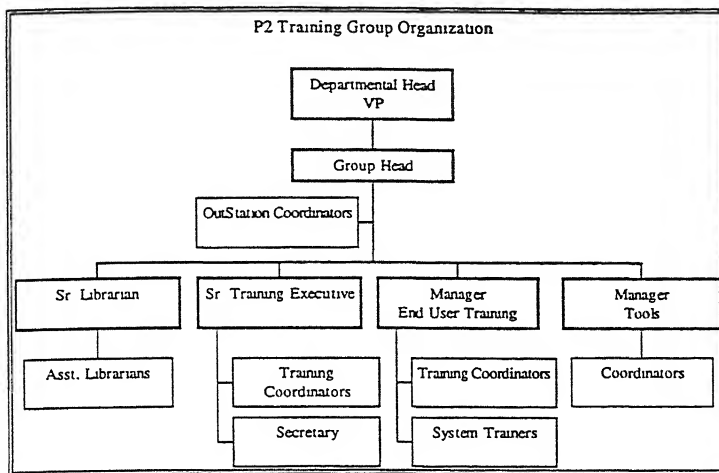


Figure 5-17 P2 Example of Support Function Structure-- Training

5.3.2.9 Summary

The most prominent feature of P2 is specialization and a well defined, clear cut hierarchy. The development groups are also fully

elaborated, with stable structures and fixed work allocations. So are the sales functions. Sales and installation are totally differentiated from the development groups. The top management drove the product development process. These consisted of the departmental heads.

The marketing, sales and installation teams were not insignificant in numbers. The development personnel were not the overwhelmingly majority as observed in the service companies.

5.3.3 The Company P3

5.3.3.1 Introduction

P3 was created by its parent organization as its prime technology vehicle with vertical specialization in providing state of the art information technology solutions to the financial services industry worldwide. The parent is one of the world's premier financial institutions. Revenues of P3 in 1995-96 have been around Rs. 30 Crore.

Among its products, it has a product targeted at corporate banking. This is a large system, that can take about a year to install. This includes the time taken to train people and the initial systems studies. The products are based on best practices around

the world and occasionally, the banks have to modify their operations to conform with the product's methods. It has products in the mutual funds business. And also product in the retail banking segment. The firm also provides IT services for the financial and banking sectors. Services like customized software, business and technology consulting etc. They also have some products related to software quality and projects management.

5.3.3.2 Market and Strategy

P3 markets its products through 7 branches in the Asia pacific region, Africa, Middle East, Europe and the US.

The parent body has influence on the strategy of the firm, given its history. The CEO and the senior managers do the planning. P3 lays a strategic importance on its packaged software with more than 50% of its current revenues coming from its banking and financial service products, mostly through exports. And more is targeted for.

5.3.3.3 Impressions

The company did not seem to have a dress code. People could be seen in casual wear. The Head office was located at the far end of an alley, and not prominently placed. The exterior was not impressive. The lobby was more functional then the interiors, which were well furnished and kept.

5.3.3.4 Size

The organization had a strength of 450 people at the time of the visit. There are about 12-13 people in the Human Resource and training group, about 7 persons in the Quality group. There are about an average of 10 persons in each of the support groups

of Finance, Administration, etc. The figures at the overseas branches number around 70. The majority of the workforce are in the development and installation groups. Followed by the marketing & support groups, mostly overseas.

5.3.3.5 Organization

Figure 5-18 shows the corporate structure of P3. According to the Asst. General

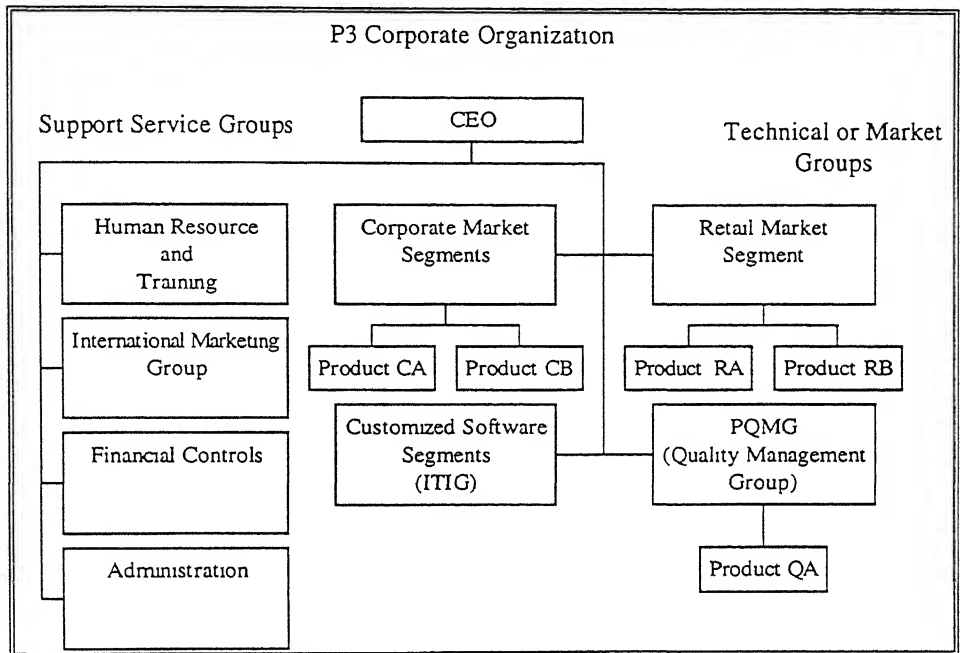


Figure 5-18 P3 Corporate Structure

Manager -Human Resource & Training, P3 is organized around market segments and support services. He also referred to the market segment groups, ITIG and the Quality groups as the 'technical groups' and the rest as the non-technical groups.

The market segment groups are the:

customized software segment represented by the ITIG group which also doubles up as the installation and implementation group.

The corporate segment group

The retail segments group.

The Quality Group which develops software quality products and also doubles up as the quality control and assurance group for the rest of the firm.

“We have little hierarchy here”, according to the Assistant General Manager (AGM)-HR. The firm sees itself as a flat organization. Though there exist different designations there are only 4 categories among the personnel, called as grades A to D. Grade D consists of the group heads & senior consultants who are mostly technical experts designated as Project Managers etc. Grade D has some minor stratification for Vice President or CEO level of executives. Grade C which consist of the consultants, with titles like Managers or Project leaders etc. Grade B is the entry level for the developmental and professionals and they are called associate consultants. Grade A is for the non professionals in the firm. And applies only to the support functions staff. He said that that the business minded personnel rise faster and can go to the top. Otherwise, they plateau as technical managers. Generally promotions are more in terms of financial rises rather than changes in grades or hierarchy.

The international marketing group takes care of the marketing of the product. The regional offices overseas take care of sales and customer queries and problems.

5.3.3.6 Development

Within the market segment groups, the personnel are organized on a product or project basis. The structure of the product group is a reflection of the product architecture. The ITIG implements the customized segment projects, & installs the products. ITIG installs the product on a project basis. At ITIG, the same group goes through the whole project from start to end. Whether the project is a customized

software or a product installation the structure of the projects and the product development groups is similar (See figure Figure 5-19).

Depending on the size of the projects, the structure varies. The structures and the numbers are not so variable in the product groups. Some times personnel are lent to the implementation teams.

The testing functions for the other products are carried out by the personnel from the Software Process Management Group (SPMG) group. They also facilitate the quality

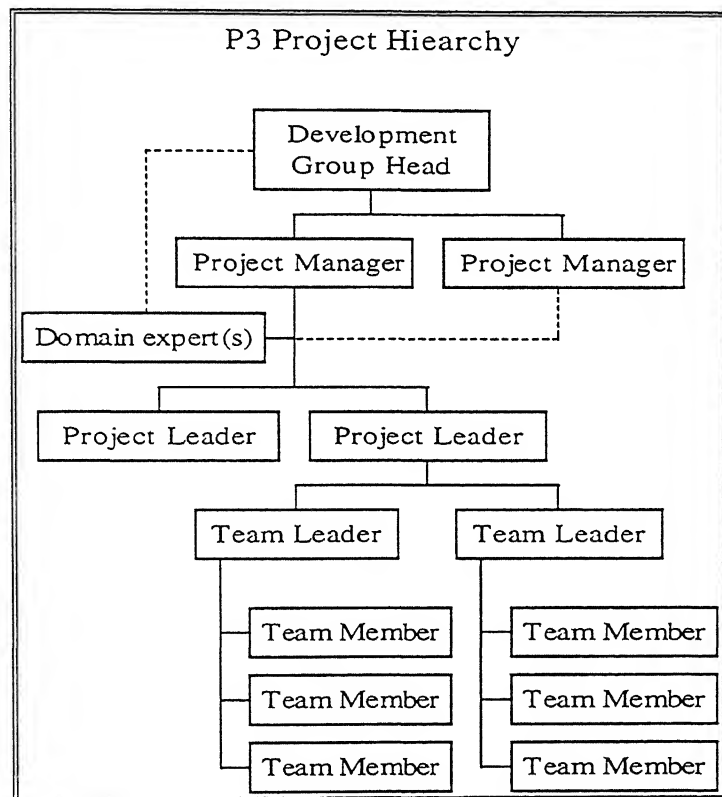


Figure 5-19 P3 Project Structure

review processes during development.

5.3.3.7 Support

The personnel in the support groups have less flexible or diverse task allocations. For example the Human Resource & Training group. The location managers coordinate the training or the Human Resource development at the various developmental sites. The

quality groups develop their own product line and also provide quality guidance to the other development groups. They carry out the testing of the products. But the quality personnel are always into quality. They do not go out on field assignments. The administration carries out the facilities maintenance activities as well. Their lowest level labor is contracted out.

5.3.3.8 Summary

P3 shows specialization with a difference. The requirements—for both the products and the customized software projects, are generated with the help of the domain experts. The quality group making a product for software quality is another example of domain experts developing the requirements for the product. The development of the products is done by different groups and the installation by another group. Yet, some members of the product development groups can be sent to the installation projects or some of the customized software projects.

The product groups are organized by their products and then by the modules as per the architecture of the product. The ITIG group is based on projects at hand.

The testing is done by the quality group. And they also have their own product.

The support functions are stable and with standard responsibilities. The marketing & sales groups are not negligible in numbers in comparison with the development groups.

6. Data - II : Across the Firms

6.1 The Generation of Requirements

6.1.1 Across Case Observation Summary

In the software service firms of S1, S2, S3 and the service wing of PS1, the client was the initiator of the software development process. The client was the source of the requirements. These were in the form of completed requirements' documents or at least were outlines. In all the service firms, the managers highlight the client's role as the final arbitrator of quality. If the client's requirements are met, the software is accepted. All the service companies' development processes required customer sign-off, before the next phases began.

In case of the product companies, the requirements were generated within the company. The management was the initiator of the software development process. What seems to emerge from the product companies is application domain expertise to develop the requirements of the products. The companies displayed familiarity with the application domain of the product. They have domain experts—either temporarily hired consultants or employed within the organization, who are instrumental in generating the requirements.

The importance of feedback affecting the requirements also emerged. All the product companies acknowledge acting on feedback got from the customers, consultants etc. The feedback was most often channeled from the sales teams.

6.1.2 Case Excerpts

6.1.3 Service Operations

6.1.3.1 The Company S1

At S1, the offshore manager for the large Account of SBU1 (Strategic Business Unit 1) explained that the client's project manager supplied the requirements. This was the starting point for the assigned offshore teams to develop the software. The manager said that the actual process of conversion of the requirements to the software was left to the offshore team. But it had to meet the client's approval.

The client manager was the final arbitrator of deciding if the software was not acceptable at any stage or not. Besides the formal progress reports, the client would occasionally clarify points or the teams would request for some if needed. Each stage or milestone of the development was cleared by the client before the next stage was progressed to.

6.1.3.2 The Company S2

At S2, the foreign parent's division generated the requirements. The s2 development teams then developed the software, under close coordination with the client divisions. The head of Quality of S2 has the following to say "Ultimately the client decides if the work is of acceptable quality. Thus his intimate and active participation is invited in the development process. This way he can be fully reassured about the work quality.

6.1.3.3 The Company S3

At S3, the Deputy GM of IBU Europe talked about their elaborate 11-13 stage development process. The process starts with the customer calling for a proposal from S3, given his needs. S3 develops an estimation. The estimation is easier if the detailed requirements are available or else it involves some system study to develop some

workable requirements on which to base the estimation. Typically, the requirements document was available from the client. Then S3 started with the software development phases. At the end of each phase, the customer had to accept and give the go-ahead for the next phase. The process culminated with the installation, sometimes with a maintenance contract.

6.1.3.4 The Company PS1

The service wing of PS1 also showed a similar process to S3. The process begins with the usual request and estimation process. Generally the client gives the detailed requirements. After the negotiations, the contracts are signed. Then subject to reviews and approval of the client, the stages are implemented. The client satisfaction decides the quality. If PS1's quality processes clear the code and the client disapproves (a *very* rare occurrence), then the work has to be redone, subject to the contract's agreements. Sometimes the work is done using the client's quality processes.

The PS1 GM of Quality, had the following to say on quality "In projects, quality is easier to achieve—you have one client, about whom you have complete information available, a controlled environment. Product quality is a more difficult issue. You have no definite knowledge of the user. The percentage input of information that contributes to high quality is less. Therefore your quality procedures need to be more rugged for developing products. Quality is thus many more important to products than to projects. In projects, satisfying the client means you have achieved quality."

6.1.4 Product Operations

6.1.4.1 The Company PS1

PS1 has a well-defined process that leads to product development. It starts with anyone within the company, giving the proposal for a product. A format is suggested. This proposal is considered through many stages and committees before it reaches the stages where the standard development processes can be followed. The stages proceed through feasibility analysis, market research, etc.

On questioning the head of the Product development center on the reason for the particular portfolio of products of PS1, he commented that “We had experience in those areas, our available manpower had experience in similar projects.” The traditional areas of PS3 before they began product development have been manufacturing, financial and insurance. Their product portfolio is a reflection of this experience.

The product’s wing of PS3 employs external consultants to help develop the requirements for its products. Not much information was forthcoming but the gist is that the product teams work together with the consultant for some period and develop the requirements. The consultants are used for their knowledge of best practices, experience and domain expertise.

PS1 uses other sources of requirements also, but they are not formalized according to the GM. He agreed that this is something they need to formalize. But informally, it is through the feedback sources: the engineers that go occasionally are required to go to the field for installation customization or to deliver product training, the sales engineers, etc.

6.1.4.2 The Company P1

At P1, the Chairman was asked how they were able to come up with such a successful product. In his answer he elaborated a lot on his family's traditional occupation of trading. In such a background, the children are expected to calculate and keep accounts from a young age. He then described his work experience in the accounts departments of various companies, before he setup his business. He said that the principles do not change, the accounting standards and practices rarely change. The basics remain same—debit here, credit there. After explaining background information he said due to all this, he very well knew how traders operated and what they needed. He said that using his businessman's philosophy he thought, "if you do accounting on computers, then use computers for accounting". Implying that instead of replicating the manual procedures on the computer, let the computer do most of them. With his son, who had a grasp of computers, came up with the product.

How do they come up with enhancements? He said that many times, the sales teams would pass on common suggestions or complaints, direct customer feedback, by following modern trends in technology like networking etc. and accounting needs of customers. He said that their package was initially designed for the small retail trader in mind. But the package now has many corporate users, including multinationals in India and exported to companies in the Middle East etc. For this they have to include some features that are suitable for corporate purposes.

6.1.4.3 The Company P2

The parent group of P2 has several process-oriented manufacturing units. P2's initial product offering supported only process base manufacturing methods and only now in the upcoming version will the ERP product support discrete manufacturing units. The

head of one of the modules certainly believed that the corporate background of P2 has a role to play in developing the kind of software they have developed. Some of the parent's firms were among the first sites on which the software was installed.

As can be seen in Figure 5-15, P2's development teams have a product champion. This designation irresponsible for generating the requirements. This person has to study the competitor products, the latest and best practices of his domain, new advances in the domain, new technological advances, etc. that need to be incorporated and extracts the relevant features to be incorporated into the requirements. This person also is expected to travel to the installations and gather feedback from the customers, gather feedback from the sales and installation team and any other source that is deemed suitable for the purposes. They also may enlist the help of relevant consultants for their wide exposure.

The product champion is explicitly mentioned in the quality manuals as the internal customer for the module of his group. Thus, He is also intimately involved in scheduling the development, monitors the development, testing, the final approvals, the documentation development and even in the preparation of the product training. He is expected to tap the feedback sources for improvements and new features.

6.1.4.4 The Company P3

P3's parent organization and sister organizations are exclusively in the financial sectors. P3 was specifically created to leverage the parent firm's IT expertise in these sectors. P3 employs professional bankers as part of their product development teams. These persons "are aware of banking needs—how banks function internally, the

business needs of banks, what services banks would like to be able to provide and manage them etc. and how best to automate them” said Asst. General Manager (HR).

The role played by these persons, as described to the investigator is very much similar to that of the product champion in P2. He generates the requirements, approves of the product features, etc. He also goes to customer sites and collects customer feedback and does some analysis, attends professional meets to keep up with his field and incorporate these into the requirements. Very often these people are at the site while the installations are on to gather feedback and look for improvements. None of the development teams involve with the customers, unless they are assigned on temporary basis to aid in training or installations.

6.2 Integration of The Marketing Task With The Development Tasks.

6.2.1 Across Case Observation Summary

The service companies displayed few dedicated personnel for the sales and marketing jobs. Also, these people were not functionally grouped as a marketing department except in S2 (see section 5.1.2.4 for the numbers and organization details). Typically, these persons were stationed abroad. All of these persons had had some years of development experience. These persons had technical responsibilities as well—to coordinate the onsite work. These persons also played the role of the onsite manager for the onsite assignees.

Client interaction is not restricted to the marketing & sales functionaries. Every one in development could be interacting with the clients. The senior managers are definitely involved as they communicate back and forth for the development. Sometimes even

the most recently inducted programmer could be involved in communications with the client, regarding the segments under this programmer's care

At the product companies, sales and marketing were two distinct groups of people. The sales & marketing persons were not involved in the development tasks and generally the developers were not involved in sales and marketing tasks. For the greater part, the development teams are not exposed to the customers. Occasionally, they may be called to give some training to the user.

6.2.2 Case Excerpts

6.2.3 Service Operations

6.2.3.1 *The Company S1*

At S1, the SBU head has marketing support in the form of a marketing manager. There is no formal marketing group besides this manager. This marketing manager is typically stationed abroad in the domain of the SBU. As far as the Large account is concerned, the onsite manager looks after business development in the account. He coordinates all onsite work, looks after new opportunities, establish and maintain relationships with clients and monitor customer satisfaction. He typically is a person with 8 years of experience, about 2-4 of which have been in development.

At S1, the quality manual lists coordination of onsite work as one of the responsibilities of the marketing manager (See Section 5.1.1.5). This necessitates some development experience. Offshore, the project managers are charged with timely deliverance of the software and acceptable quality and obtain customer acceptance. This involves numerous meetings with the client starting from the initial estimation processes to the final delivery.

According to the marketing manager, the client (the client firm's project leader in this case) can call up any team member if the client has any problems with some module developed by the member in question. Typically the queries are routed through the module leader or the leader of the project. But often it happens that the client directly calls up or communicates with the team members. In one issue of in-house journal of S1, there were some glowing examples of how some large accounts grew from 3 onsite assignments to 100 person strength. The client also honored some of the better performing engineers, who are now in more senior positions in the account. Elsewhere, in the same issue the profiles of some of the very high executives are given. One of the executives was portrayed as having contributed a lot to the growth of one account. In the CEO's message, he highlights the fact that S1 depends on people who "enjoy building relationships".

6.2.3.2 The Company S2

S2 was the only firm with a specialist marketing department. Though it was implied that the primary task was more of a liaisoning with the customers. There were about 2-3 people per technology group. And "they have to be technology literate". "Delivering actual client satisfaction and ensuring repeat business lies in hands of the project teams through their work quality" according to the VP. This because the project leaders have to understand what the client really wants and give the estimates. And then they are the ones to fulfill the estimates.

Here also, the client could interact with any one if needed. The marketing people mainly took care of the business ends of the interaction. The project teams delivered the technical solutions to the problems of the client. And the client could be requested

midway in case of any clarifications or he could want to make some clarifications to the developers.

Thus at S2, the initial and later business interactions are handled by the marketing department. The technical interactions with the client are handled by the development teams

6.2.3.3 The Company S3

S3 is organized as per geographical market area. The offices catering to these regions have about 3-5 people. These function primarily as sales offices. The SBU is incorporated as a company in the area of operations. The sales people handle the accounts, grow it, act as liaison offices to the Indian offshore teams. They coordinate the onsite work as well. They have had some years of development experience, otherwise they will not be able to realize what the customer desires. This was stated by one of the managers. He added that no one with less than 2 years of development experience was sent abroad.

The techno-commercial head of the European operations conceptualized the operations as marketing and using skills. He said that the process of developing customized software involves “a heavy customer engagement process, from the sales personnel, to the CEO, development managers do the lowest level of programmers”. Some times the customers also come down to see the facilities, etc. before signing the contracts. He elaborated that the quality and timeliness of the software are the 2 most important criteria for which outsourcing to India occurs. These he said is in the hands of the development teams and their managers. And these ultimately decide if the clients are satisfied or not. Thus at S2, interactions with the clients encompasses almost everyone in the development area. *The Company PSI*

The service wing of PS1 tacitly acknowledges the marketing role of the developer. The senior marketing manager, of about 6 years of development experience explained about the origins of most offshore projects. He stated that most of the offshore projects had their origins in the 4-8 months contract programming jobs. These initial 2-3 assignees are persons with over 2 years of experience. Often, these people, have spotted opportunities for growth and informed the higher company officials. On further directions, these persons discuss the possibilities with the client. "If these people have been able to favorably impress the client during their stay that plays a great role in convincing the client to try out PS1." This typically results in bigger contract programming jobs. Gradually the clients are convinced about the companies technical capabilities. Then they trust the firm enough to outsource bigger projects offshore. Commenting on this process, the Country manager explained "the customers are hesitant to give out projects, unless the company is known better." The marketing role of the developers is clear.

Very much like S3, the service wing of the PS1 operates with an organization around geographical markets. Each of the SBU's has an office stationed abroad that does the sales tasks. The managers in PS1 conceptualize the sales as front office operations with the offshore software factory as the back office operations. There are a very few people stationed abroad as part of the sales office. These persons also monitor the onsite projects. They would have had not less than 2 years of development experience, typically about 4 years.

Regarding client interaction, the managers said that it is unavoidable. That to some extent, the fresh developers can be "shielded" or "hidden" from the clients, till they

have got more confident with the development tasks. Otherwise communications with the client are a “part of life” in customized software development, according to them. The Country manager-exports explained that the people who are on the fast track (people with suitable qualifications, and who show better marketing aptitude along with technical skills, rise faster Hence fast track) have been bright to spot opportunities in their interactions with clients and thus rise faster They are also assigned to the offices abroad for some time

6.2.4 Product Operations.

6.2.4.1 The Company PS1

The products development center of PS1, has dedicated development groups for its own products The marketing & sales of all products are looked after by the SBU's The development staff have no involvement in the marketing or sales functions The sales and marketing groups have no knowledge of the development of the products

Among the SBU's, the Asia-Pacific and the Indian SBU's do most of the product marketing These display a well developed sales organization (See the section 5 2)

The development people have very limited customer contact They may be called upon to impart some training or to do installation They are not in a position to affect the sale of the product to which they are imparting the training as by this time, the customer has already bought the product

6.2.4.2 The Company P1

At P1, the managing Director is the one-man development team Almost everybody else in the company is involved in the sales and marketing of the product exclusively The Chairman and father of the MD is involved in the requirements generation, and

there are 2 other people who test the product. No other persons have any thing to do with the development functions. The daily sales, marketing and customer support was handled by the rest of the organization. And the MD had no other involvement in the sales and marketing.

The customer contact of the MD seemed limited. With every new version of the product, he imparted training to the company personnel. In an annual dealers convention also he imparted training. For customer service, he was called for only when no one else was able to solve the problem. And such instances were rare.

6.2.4.3 The Company P2

At P2, the sales and implementation team under a GM Sales, handles everything regarding the sales, installation and customer service of their ERP product. The overseas subsidiaries are meant to do the same in their geographical areas. The other product groups also have separate organizational setup to handle their sales and marketing.

The development teams of P2 have no occasion to interact with the customer. They are not required for training or customer support. They do only development.

6.2.4.4 The Company P3

At P3, the ITIG (see Figure 5-18) looks after the sales and implementation of their products. P3 has 2 major product lines and each has its own product development teams. P3 has an international marketing group that looks after the marketing aspects of the products.

The development teams are never called upon to do any sales or implementations or marketing activities. They have very limited customer engagement opportunities. That too in post-sales activities like customer training and some installation support. Customer service and queries are all handled by the ITIG.

6.3 Specialization Of The Development tasks.

6.3.1 Across Case Observation Summary

The service companies portray none to very little differentiation of duties among the development personnel. Project structures are defined in terms of roles. There are few instances of persons who specifically are meant to fill the same role in any project. Generally the project teams take the project from start to finish. The analysis, design, coding, documentation, testing, installation, training and maintenance if any are all done by the same project team. Outside support is asked for only in case of the reviews and quality audits of the project.

The product companies display differentiation among the development tasks very clearly. As elaborated on in the Section 6.1, the requirements are generated by a different group of people, who do only requirements generation. The design and coding is done by a different set of people. A different set of people do the testing. The documentation of the product is apparently done by the developers in most cases. A different group of people do post-sales, activities like the installation, customer training, customer service etc.

6.3.2 Case Excerpts

6.3.3 The Service Operations

6.3.3.1 *The Company S1*

S1 has a very small dedicated documentation group that provides training and assistance for the developers in their documentation tasks. The documentation is actually written by the project team members. The documentation group does not assign its members to the projects.

There are roles in any project team. Every project team has someone occupying that role, but in the next project someone else may be in that role. S1 has no other specialist groups or divisions that lends people to the projects.

Every project has a Quality Coordinator (QC), and an internal quality review team. There is no group that provides Quality coordinators to all projects. The project manager chooses the QC from his project team, generally a senior, experienced developer. Each project also has an external review team. Just as some members of this project are on the external review teams of other projects, members of other projects are review team members for this project. There are no members who are *only* on external review teams. Except the QC, everyone else is carrying out some development or design or project management tasks as per their experience and roles. For the duration of a project, the QC may not be doing any development. In case of small projects, the QC could be doing other tasks as well.

The department of quality just aid, in the quality processes, just as the documentation group aids the documentation process. Ultimately, the project members do the documentation or quality reviews.

When the software is developed members of the team are assigned to do the installation and user training. Some of the team members are retained for maintenance and the group members are disbursed to other projects or are sent into training in anticipation of upcoming project requirements

All of the development personnel belong to the pool of development staff, or project managers of the SBU and do not have any other specialized, departmental attachments

6.3.3.2 *The Company S2*

According to the VP, the only permanently assigned development people are the core analysts who permanently belong to the technology groups. Otherwise the team members are freely assigned to whichever group that is shorthanded. They are given training as per anticipated needs and if needed. As the team members gain experience, they settle down in one of the technology groups as core analysts. But till then they could be playing different roles. The same team saw through a project from the start to the finish. From initial estimates, analysis, coding, documentation and maintenance if required. Also, if required, installation and training.

As in the case of S1, except the senior, core analysts, no other developmental staff belongs to any particular department.

6.3.3.3 *The Company S3*

S3 portrays some specialization of developmental activity (see Figure 5-7 for the ensuing discussion). Every project has assigned to it a Technical writer. These technical writers are meant to carry out the documentation activities of the project. The technical writer could be part of different projects also, but is always doing the documentation tasks.

The quality facilitator also is a specialized role. This person is always from the quality group. This person also could be simultaneously part of different projects, but always is the quality facilitator of the project.

The test team leaders and members are dedicated to the project, but for the duration of the project. In the next project, they could be developers. That is they are not in the test team role every project.

The project team does all the phases of the development activity from the analysis, design, coding, testing, documentation (with the technical writer) maintenance and post development activities like installation, training etc. as needed.

6.3.3.4 The Company PSI

After its recent reorganization PSI has decided to specialize some duties. These mainly pertain to the experienced people. These come under the Project service group. PSI project structure has an independent role of the solutions architect (see Figure 5-9). This person is to provide assistance in the requirements analysis & specifications stages. Most likely these people are to have had considerable experience & expertise in executing particular kinds of projects. These architects can be serving more than one project simultaneously. Similar, but as yet unimplemented is the role of the technology specialist. This role will be like the solutions architect an expert, but in some implementation technology domain rather than the application domain. Both of these experts could be on multiple projects simultaneously.

The project manager appoints people to the roles of Quality in charge, the quality control team, the Delivery coordinator, and the configuration in charge. These are all well defined roles but people filling these roles will not be playing these roles in all

projects always. For different projects, different people could be filling them, while some other time could be developing. The module leader has specific responsibility to look after the preparation of the user and technical manuals.

The same project team does the analysis, design, coding, testing, documentation and also installation and training duties. For maintenance, some people retained within project or could be later on recalled in some cases.

6.3.4 Product Operations

6.3.4.1 The Company PS1

PS1's product center displays specialization in many places. The company employs external consultants to develop the requirements. PS1's product development teams are organized according to the product they make and the members are not freely switched between products. There is a separate testing group and a separate products support group. Each product team has a separate testing team assigned to it from the testing group. Members of these teams do not change places like the shifting of roles and duties in the service operations.

The product teams do their own design and coding and documentation. The test teams from the testing group provide testing. The product teams also do the maintenance and revisions of the product. The SBU sales teams do the marketing and selling of the products. The product groups provide product training to the SBU sales teams in their respective products. This team is distinct from the development teams.

The product teams are sometimes called upon to do some installation of PS1's ERP product. Then some of the members are deputized to the task. The other products installations are simpler and can be accomplished by the sales teams of the SBU. Each

of the product has a product support group that takes all queries and problems from the customers regarding the products.

The product operations of PS1 show more stability and constancy of roles and duties than the service operations of PS1.

6.3.4.2 *The Company P1*

P1, though did not have designations, they certainly had a clear division of labor. At P1, the requirements were done by Chairman and the MD. The design, coding & maintenance was done by the MD, perhaps, also the documentation. There were 2 people who did testing. 2 people did what was called the packaging. This essentially was making of copies of the product for distribution. The installation and customer support was handled by the rest of the organization (see Figure 5-12). Customer training was done by the sales persons and dealers. Dealer training was imparted by the MD and the testing groups.

6.3.4.3 *The Company P2*

P2 evidenced more differentiation than any of the other companies. Each product and product module had a dedicated development team to it. People were not freely moved from one group to the other. The development groups did the design, coding, product level testing, and maintenance. As explained in Section 5.3.2.6, the requirements generation role was specialized by the product champion. A documentation division created all the user and technical documentation, with input from the concerned developers and associated people. A specific group did system level tests. There was a special section of developers who created the

lowest level software entities that were common across all of the ERP modules. The sales and installation teams did the installation. Separate customer support groups took care of customer service through the overseas subsidiaries and from headquarters also. The user training was handled by the training department. The developers were not all called on, to aid in these activities.

6.3.4.4 The Company P3

At P3, the development teams were organized according to the products lines. The development of each of the product lines is at different development centers. The differentiation is as below.

Each of the products had its own development team. The development teams did the design, coding, and maintenance. Requirements generation for each of the products was a specialized function. A separate group does the installation and implementation. The persons who do requirements generations are part of the liaison team while installation is going on. The product developers are called on to impart training to the users.

- The customer support services are carried out from 7 regional centers around the world.

The juniormost of the personnel, the fresh developers do only coding, and reviews of each others coding. The module leaders supervise their coding efforts and are involved in individual programmers designs and the coordination of the programmers modules and programmers. The project leaders, and the module leaders are the ones doing the

design of the software. The project manager, and project leader and occasionally the module leaders, are involved in the analysis. The project manager is looks after the project management activities. Customer satisfaction is primarily the responsibility of the PM. Though the PL and ML have their own customer satisfaction responsibilities. In all these activities, the people are not specialized. The activities could vary as per the size and importance of the projects. In one project, the programmer himself could be carrying out everything independently if allowed. In another, the module leader could be doing project management activities.

6.4 Staffing Requirements

This section explains the patterns of staffing requirements found in the companies.

6.4.1 Support

6.4.1.1 Summary

All the software companies studied, showed similar staffing patterns in the HR, Finance and systems support areas. The work in these areas is like in any other company, with specific & standard personnel requirements and available educational profiles.

6.4.1.2 Excerpts

The finance dept is staffed with accountants, MBA-finance people. The HR dept is staffed by MBA in Labor or Personnel Management and MA(social work or Personnel Management). The systems support personnel are typically Electronics Engineers, some with added Netware training certification. Some are computer engineers with a penchant for systems. Sometimes ITI personnel, are employed, to do the minor hardware maintenance functions. They are cheaper, than the more mobile systems

engineers. This also frees the heavily loaded engineers for more critical tasks. The Administration dept. has no specific recruitment requirements for the entry level jobs. It is sufficient for them to be graduates. The administration looks after functions like reception, telephones, infrastructure facilities like canteens, tea, electricity, desks, etc. All the companies studied handed out the housekeeping & security to contractors.

All the companies studied showed very little secretarial staff. Typically only the senior executives have allotted secretaries and often, are shared among executives or performed multiple duties

The major focus of the study was on the staffing of the marketing and development functions. Here the following patterns emerged

6.4.2 Marketing

6.4.2.1 Summary

The primary difference among the service and product firms studied was the requirement of technical experience⁴ for the marketing people

The product firms did not emphasize technical experience. In the service firms, it was mandatory. On the other hand, the product firms required formal education in the application domain; e.g. P2 required MBA (Production), P1 required commerce graduates

6.4.2.2 Excerpts

The service firms studied, deployed personnel with significant years of development experience (at least 4 years). Preferably, with higher educational qualifications. So far,

⁴ Technical experience here implies expertise in computers and software

experienced developers only, go to the SBU on marketing assignments. It is not clear if under the new organization this practice will continue. The senior managers indicated that they would expect the next generation of personnel to be MBAs', besides the technical experience. There are very few marketing personnel stationed at the offices; around 10-13 at the most. These people also look after the coordination and guidance of the onsite developers, and this is another reason for their experience. The service wing of PS1 was again similar to the others in having experienced developers assigned to do the marketing. These assignments seem to play an important role for the top positions, as could be surmised from the profiles of the Sr Managers.

In the Product companies, the marketing function has particular work force requirements. According to the product being sold, the marketing personnel are supposed to have formal qualifications in those areas. e.g. P1 required their marketing persons to be commerce graduates. In the words of a senior person there, "... they must know how accounting is done. How else are they to understand what the customer is talking about. We can only train in how to accomplish accounting procedures using computers and our package ", P2 hired only MBA's in their sales dept. and were deployed according to the match of their specialization and the module; P3 employed professional bankers for the liaison with customers. The product operations of PS1 required a separate team for the marketing, most of which were MBA (Production). In none of the cases were these people expected to have technical expertise about computers and software, other than the product training they got.

6.4.3 Development

6.4.3.1 Summary

There is some difference among the hiring of the development personnel at the entry level. This is the educational background of the software engineers in the core product development teams. All software companies understandably prefer computer science engineers. BE (any branch)+MCA is the next best profile. The product companies prefer experienced personnel to have had relevant exposure to software development related to the domain.

6.4.3.2 Excerpts

The service firms studied, took in people irrespective of their educational qualifications. Thus anyone cleared by the recruitment process is acceptable. These processes focus on aptitude of the person. Thus the investigator met MBA/M Tech/M Com/B Sc /BE/B Com/MCA as well the NIIT diploma holders and combinations of the list, among the developers. Higher formal education is an advantage in promotions & on-site assignments. Almost without exception, the senior managers had professional postgraduate qualifications.

The product development groups of P2 and P3, seemed to be populated only with engineers. As a person from HR in P3 said, “we take only engineers, for their superior analytical abilities”. The GM for the product group of PS1, commenting on the kind of people he expects. “system programmers, people with analytical ability, creativity, flair for lower level programming, and an attitude that does not seek immediate results”. It was a rare person with a non-engineering background among the product groups. This too is possible only if they had relevant experience in domain of

application In one group at P2, only computer science engineers were taken. This group developed some critical parts of the software

The product installation groups of P2, P3 & PS1 operated similar to a service firm, working on a project basis. P2 took MCA's, MBA's and NIIT diplomas in this function The MBA's were the analysts, the other two kinds were put in the technical services of the region P3 permitted MBA's in their installation groups. PS1 sometimes borrowed people from the service wing for the installation group.

P2, P3 both employed application domain experts for the job of the business analyst⁵ These people were part of the product development team and their job is to scan the available academic literature, evaluate competitor products, trade journals, trade technology, seek customer suggestions, observe the business processes, etc. Then, they generate the requirements for the product's next version PS1 sought outside consultancy for this purpose. In general, people who fill this slot, are experts in the application field of the product, typically either have field experience or are doctorates in that field, with some technical training

For people above entry level, the service companies are glad to take in anyone with over 2 years of experience Their educational backgrounds are not so important Product companies take the experience holders only if they have had experience in the relevant area. For example, P3 takes in experienced people only if they have had experience developing insurance or financial software At P2, a manager, (with significant experience in the manufacturing sector) from a service background, was

⁵ This usage of the term business analyst here is to denote his knowledge of the business processes of the domain the term is not meant to convey the designation of business analyst

inducted at a senior position. He was inducted, not in the product group, but in the installation group, that operates almost like a service company

In the product firms, P2 for example, one product head remarked that though developers are allowed to transfer between product groups, they are expected to stay in one group for at least 2 years “It takes at least a year before they start contributing actively One has a lot to pickup about the product, besides the technical matters” she said. A manager in S3 said “ on-site assignments are allowed only after completion of at least 2 years of development offshore”. The statement that “At least 9 months to a year must pass, before we can recover the costs of training the fresh recruit” was reiterated often during the study.

Then there is the matter of customer acceptance, particularly in the Service firms This comment by the training manager of S3 succinctly states it “ The customer will not accept any employee-types with less than 2 years experience and especially the Asia-Pacific region, of non-engineering backgrounds What really counts is the absorption capability In experienced people, the depth of experience is seen ”

6.4.4 Training

6.4.4.1 Summary

There is a marked difference in the training patterns of the service and product firms studied The product companies include formal & regular training on the use of their products, that is completely lacking in the service firms The service firms all have programs for non-technical training especially communication skills

6.4.4.2 Basic Training

Almost all the companies studied, have a common induction program that is given to any new comer to the company. Typically it is of around 3 days. Here, the company's philosophy, business goals, departments, and more importantly the basics of the quality system of the company are introduced. The senior executives of the firm address these sessions.

In the service companies, the fresh development recruits undergo about 2-6 months of training. In S1, there is a 10 day common training for all the developers, after which SBU group to which a fresh recruit are allocated, takes over the training. In the service wing of PS1, the fresh recruits are sent to an external training agency for 6 weeks. S3 has an 8 week common training, then specialized training as per the division allotted. All these training's are mostly fully technical. A small part of it is effective communication skills, personal effectiveness, etc.

In the product companies, besides the technical training, the fresh developers undergo training specific to the product group they are to join. This includes the internals of the product and how-to-use training. All of P1, the Installation groups of P1, P2 & PS1 are trained in the usage of the products. This training is redone everytime there is a new version. Since all of P1 undergoes product training, anyone can provide customer support and installation. More importantly, this frees the sole developer from the training task, as they in turn train the dealers, customers etc. P2 and PS1 have some common training for all the developers, on some internally built modules, that are common across their products. After this, as per the product group they are allotted to, they undergo training on that product. P3 has an intensive standard training schedule.

after which the departmental training takes over who give the product training. The product wing of PS1 has a technical training, including training on the usage of the internally developed tools. Then the allotted product group's training is undergone. Vendor/customer training is an important aspect of product companies training schedules. The product development group in PS1 does the product training to vendors, customers.

6.4.4.3 Continuous training

Continual training occurs in the companies visited. All the companies have around 10-14 days per annum per employee, reserved for training. This includes the senior managers as well. (But it was commonly noticed that their actual training falls short of the 10 days). That means that an employee has to spend around 2 weeks of formal training sessions. There is a lot of informal training going on among the development groups. These take the form of lectures of the special interest groups on their particular specialized technical topics. S3 has such special lectures for Sr managers as well. They have a program once a month for the sr managers where there is at least one presentation on an area of common interest, video presentations on culture of various countries, quality, etc.

In the typical continual training process, the project/product head sponsors the names of the candidates for training. This is done after discussions with the concerned developer, in concordance with the objectives established during the annual appraisal, and the expected needs of the group/project/SBU. Sometimes the HR itself recommends people for training, driven by company-wide requirements, and the profiles of suitable persons.

Across the studied service companies, there is lot of focus on communication skills. Not only is it part of the Basic training, but also features prominently in the continual training programs. PS1 often has external faculty (professional consultants) take sessions on presentation skills, written skills, verbal and non verbal skills. S1 has periodically occurring such courses, referred to as the inter-personal programs. At S3, during the project work that the recruits have to make, they are expected to make frequent presentations.

Then there are also regular courses on management skills. These are for various levels, depending on the number of suitable candidates and corporate needs. The project supervisor recommends to low level management skill courses, if there is or going to be a need for such skills within the project. Requests for non-technical training are easily acceded to. On the other hand, the technical courses on newer topics, etc. are on a need basis.

All the service firms studied maintained a detailed record of the skill levels of their employees. The training details are used for manpower planning.

There are some examples of non managerial and non-technical courses. PS1 & S3 both had courses on Corporate etiquette. These were mandatory for those being sent on-site assignments. S3 also runs language classes, for the Europe & the Asia SBU's.

In the product companies there was a noticeable lack of emphasis on communication skills. In the product wing of PS1, sponsorship to the corporate wide, HR driven communications skill's courses was generally not often. The HR Training manager remarked on the absence of the product personnel in such courses. Such courses are

not seen as important by the managers there. This was sharply contrary to the service wing of PS1

P1 had no concept of such training, nor did it have any other training needs except product training. P2 has had plans to implement “the HR training”⁶, but were not carried out till the time of the study there. The training courses available there were either technical or product. The developers are sent for technical training only, unless the developer is to change product groups⁷, in which case the developer had to undergo the required product training. The sales group, which actually sold & installed the software underwent product user training, and the usage of the technical tools needed to make modifications for installation.

6.4.4.4 Training for other functions

The other support groups, such as the systems support, HR, administration had no special training programs available in any of the firms studied. Only in PS1, anyone could be sponsored to the non-technical courses. S3 mentioned training for the finance cell, which was for 4-5 days only. The business analysts (the doctorates/domain experts) do not require training, though they may opt for non-technical courses or external training in their fields. Each of the firms had one small special group that performed the equivalent of R&D for the firm. This had its own training needs that were satisfied internally.

The product marketing groups needed no other profession related training. They underwent just the product user training. The service marketing persons would have

⁶ At P2, the training division took care of all the training needs. The HR dept. took as its responsibility to provide the ‘development’ courses such as personal effectiveness, communication skills, presentations skills etc.

⁷ P2 allowed developers to move into other groups after a minimum of 2 years in one group.

been through sufficient non-technical & management training as developers. This is one reason why they are eligible for an on-site assignment. As mentioned earlier, S3 & the service wing of PS1 had some special courses for those going for on-site assignments abroad.

The senior managers in all the firms studied underwent management training suitable to their work profiles, to fulfill their compulsory training time.

6.4.4.5 Faculty

Across the firms studied, the faculty for most of the courses were persons from within the company itself. Only PS1 had an external agency do the standard training for its fresh inductees. The others went for external faculty only when unavoidable. S3 had 2 resident faculty, for a foreign firm's product that S3 was using internally & later plans to market (this highlights the need for product training for marketing purposes). This was because S3 did not have any person within the company familiar with the tool.

The faculty for the fresh graduates would be persons with about 3-4 years' experience. The non-technical courses were often given by the executives. Management courses for the lower levels were always given by the executives. The training for the senior executives is sometimes given by management consultants or very experienced customer's managers (in case of service firms) are invited speakers.

Across the firms, the faculty for the training were in-house. This places a great burden on the development people who anyway have deadline pressure, particularly in the service firms. Yet this is seen by the management as a necessary task and no one is allowed to shirk for long.

“ It takes some time rounding up faculty to take the training courses” said the PS1 technical training coordinator. At PS1, the float⁸ who have had about or more than 3 years of experience are expected to involve themselves as faculty or in special internal projects or be under self-training under the supervision of the Technical training coordinator. In S3, the involvement in training programs is seen as an advantage in appraisals. The students rate the faculty and this rating is added to the person’s database. P2 lists employee development as a management competency area. P2’s HR keeps records of the faculty’s performance as well as the students.

⁸ In PS1, the pool of unassigned developers, who are in-between assignments are called ‘float’ or ‘Bench’

Chapter Seven

Conclusions and Learning's

This chapter analyzes the observations from the cases with respect to our framework.

Then conclusions are drawn and the suggestions are based on observations

Parameter	Software Service Companies	Software Product Companies
I Organization	<ol style="list-style-type: none">1 Organized around the markets served2 Numerically, developers in overwhelming majority, with a minority of support staff3 Development groups are not stable, Variably organized, depending on size & nature of projects4 The top development managers play dominant role in deciding strategy i.e. what kind of projects can be taken up or not5 Everybody in development groups, in contact with customer, besides the people for sales etc	<ol style="list-style-type: none">1 Organized around the products developed2 Numerically developers not in overwhelming majority, Support staff is accompanied by dedicated marketing staff, which is a sizable strength of the company3 Development groups are stable; Organized around products/product's architecture4 Top management, not necessarily composed only of development managers, decide strategy.5. Only specified employees in customer contact. Not necessary that they have development experience
II Source of Requirements	<ol style="list-style-type: none">6 Client drives the development process No development occurs till client initiates the business cycle And development ends when the client is satisfied that his requirements are met7 No apparent role of application domain knowledge affecting the choice of clients sought8 Client hand down the requirements9 Sign-off at every stage is a must The software delivered has already most of the feedback the customer could provide There are no new	<ol style="list-style-type: none">6 Top management drives the development process. Development continues in terms of improvements, irrespective of customers. It is the management that decides if the software is ready for release7 Evidence of top management familiarity with the domain of application of product.8 Special, domain experts develop the requirements9 Feedback from customers affect the requirements of the next version/release of the product

Parameter	Software Service Companies	Software Product Companies
	releases, only new projects	(but not compulsorily).
III Integration of Marketing With Development	<p>10 Few personnel explicitly dedicated for marketing tasks They also have some technical duties of on-site coordination</p> <p>11 Client interaction happens with all levels of development personnel</p>	<p>10 Dedicated distinct groups, each for sales & marketing and for development Division of technical duties within the sales groups</p> <p>11 Client interaction <i>almost</i> exclusively the domain of a sales and implementation team</p>
IV Differentiation of Development Activities	12 No major differentiation evident Same team carried on from start to finish	12 Specialization most evident in the requirement generations & testing tasks & installation
V Human Resource Requirements & Training	<p>13 Recruitment of freshers for development or marketing is not differentiated</p> <p>14 Engineering educational background preferred But if aptitude is displayed, any educational background topped with some computer courses will do</p> <p>15 While allocating manpower to a project, the client has a say in the staffing of the project</p> <p>16 During Appraisals, the clients input is also considered</p> <p>17 Regular training courses for interpersonal communication skills & other non-technical training are available Besides the technical courses</p>	<p>13 Different recruitment processes of freshers for development and marketing as also for the other groups</p> <p>14 Particular about the educational background of recruit</p> <p>a)for sales & requirements generation education should relate to the product</p> <p>b)For development engineering students</p> <p>15 No involvement of customers in placement of recruit into development group</p> <p>16 Customer input does not count in appraisals</p> <p>17 Primarily, courses on product training and technical training.</p>

The table above summarizes the observations from the cases. The table indicates the differences that emerge among the product and service organizations. We now analyze the evidence with our respect to our hypothesis's

The Evidence

Organizational Configuration

From the observations, we gather the characteristics of the organization in software service firms.

- 1 The service firms are overwhelmingly dominated by developers. In terms of power and population, the top posts are held by managers who have risen from the development ranks. The support functions are very much in the minority population.
2. The top development managers can decide on what projects can be taken up or not. The support functions do not make business or operational decisions. The top management is made up of people who have been project managers.
- 3 Service firms operate with projects. These projects are executed in close contact with the client. The client has to approve each stage. Satisfying the client by meeting the client's demands and standards is of prime importance. The developers work with different clients at different times in different capacities. They do not 'belong' to a particular department because there are no departments to work in, but projects. The only departments visible are the support functions.

4. Everybody has to master the skills of software development before being given other responsibilities. The software developer is more valued for his experience. The really important functions are performed by people with greater and greater years of experience.
5. The general impressions gathered and particularly the dress code, indicates that the service firms give a lot of importance to the appearance of the personnel, the looks of their offices etc

Requirement Origins

The service firms show an elaborate process that involves the client. The following additional features are noted

- the customer initiates the development process with a requisition for estimates. The client provides initial requirements to base the estimation. Then the cycle of information exchange and software development starts. No development occurs without clients.
- the client has to sign off the stages as they proceed. This calls for close involvement by the client. This way, nothing is implemented that the client does not approve of. Everything that the client feels is required is implemented. It gives the client more control over the development process, to the client's satisfaction. It requires the client to provide the needs and to let the firm implement.

- The firms did not seem to give much importance to the application domain knowledge. The firms emphasized technical competency applied to a variety of projects.

Integration of the Marketing Task With The Development Task.

Except one, all the service firms display geographical, market based SBUs. With the head offices of the SBU located within the region of the SBU. The following points are clear:

- There are very few people allocated expressly to perform marketing roles. These persons are stationed at the SBU overseas offices. They also have the dual roles of acting as the managers of the onsite developers. They have little role to play once the development process is underway. There, the client and the development team interact directly.
- All of these people have had about 3-4 or more years of development experience. They need not be posted abroad for long duration. These are plum assignments and all the top level managers have records of such assignments.
- Contact with the client occurs at all levels in the firm. It is not possible to isolate the interaction. The clients like to monitor closely, sometimes the developers need more information.

- The people who rise speedily in the company have played a role in growing the business. They are able to spot opportunities in interactions with the client.

7.1.4 Specialization of Tasks.

The service firms display a singular lack of differentiation among the people. The roles exist in the project structure, but the people who fill them change each time. The employees of this project, in the next project could be carrying out different duties as assigned to them.

The same team carries the project from start to finish. It is not as if different people, come and go, doing the same tasks in different projects.

7.1.5 The Human Resource Management & Training

The service firms allow client influences in the placement of people in projects and in their appraisals. They also show the following:

- Freshers are put into coding jobs. An engineering qualification is preferred.
- Client intervenes in the posting of persons onto their projects. Their input is also considered in appraisals.
- The training programs have a variety of non-technical courses besides the technical programs.

- The faculty for the training programs are the more senior operational people within the firm. Participation in training programs is seen as positive input during appraisals.

7.2 The Analysis of The Service Firms

We conjectured (See Chapter 3) that software service firms would portray a resemblance to Mintzberg's "Professional Bureaucracy" (Mintzberg, 1979). Software service firms would show features that are typical of service organizations: Coproducer role of the client, inability to separate the marketing from the operations. We now see how the evidence supports our framework.

7.2.1 Likeness to Professional Bureaucracy

The organization of the software service companies into market oriented SBU's, the prominence of a large, dynamically organized development workforce supported by small support departments, powerful project managers, closeness to the client etc. all point to Mintzberg's organizational configuration of Professional Bureaucracy. The following discussion refers to Mintzberg, (1979).

According to him, the key, dominating part of these organizations is the operating core, in this case the developers. The operating core dominates and is supported by a small support structure. The support functions are well elaborated hierarchies and little variation in tasks. The professionals in such organizations have considerable freedom and have no rigid structures or hierarchies. In the professional bureaucracies, the professionals have to work directly with the client. They need the freedom to be able to satisfy the unknown and varying demands of the clients. About the work of

professionals, Mintzberg says "Control over his own work means that the professional works relatively independently of his colleagues, but closely with the clients he serves "

The phenomenon of independent work is seen in these firms. The project is like a complete mini firm in itself, and has all resources within itself. The projects are given the requirements of the client. The client allows them freedom in the actual solution of the requirements, so long as he is able to trust and is satisfied with the solution. The project in a software services does all the tasks from design, coding, testing, etc. for the client from within itself. It operates independently of other projects.

Peer review Yet the projects are not totally independent. The projects must depend on the other project groups in the firm for quality assurance. "Professional organizations have standardized work but complex enough that it must be controlled directly by the operators who do it. And the work can be judged only by similar operators." As observed, the reviews of design, code, etc. are all done by colleagues from other projects or other modules within the project.

The associated parameters of professional organizations to a dominant operating core are the training and indoctrination of the fresh recruits. Mintzberg says "Training and indoctrination is a complicated affair in the Professional Bureaucracy...with long period of on-the-job training, such as internship in medicine and articling in accounting. Here, the formal knowledge is applied and the practice of the skills perfected, under the close supervision of members of the profession." In software service firms, the on-the-job training and indoctrination appears in the form of the initial 1.5-2 years of close monitoring by the module leaders and team leaders. It is only after the 2 years that serious responsibilities are given to the person. And the process of training is continual.

as the professional have to master new knowledge as it comes. This highlighted by the high amount of time ear-marked for training The senior members of the firm impart the training This leads to indoctrination and handing down of the culture of the firm and its methods to the freshers

The software industry exhibits apprenticeship nature that reflects a craft industry [see, Schware, 1990] Experience counts a lot in measuring the maturity of the developer

This training period imparted to every one leads to a standardization of skills According to Mintzberg, the Professional Bureaucracy is relies on the standardization of skills “These skills are imparted under the close on-the-job training and indoctrination Everybody is thus aware of what needs to be done, and what to expect from the others This helps in coordinating the loose configuration without strict structures, rigid rules etc ” The software service firms depict the standardization of skills as everyone in the organization has had developmental experience The senior executives rise from the operating core, the marketing assignees are sent only after they have had some years of experience There is none in the operating core who has not had developmental experience All except the minority support staff have development experience And these support staff never meet the client and instead, they provide services to the professionals

In Professional organizations, the professionals form the administration The professionals not only make the administrative decisions but also the business decisions As seen in the software firms, the senior management are from the development groups. That is besides the support group’s heads, the Vice Presidents,

the SBU chiefs, etc. have risen from the development body. They form the overall strategy making body of the firm.

The prime examples of Professional Bureaucracies given by Mintzberg are craft production firms, personal service firms, Hospitals, public accounting firms etc. *All examples taken from the service sector* As the authors in Section 2.4 portray, the Indian software industry is mostly providing manpower in the form of coding services Brooks and others (See Appendix 2) have compared software development to a craft These features point to software service firms to display characteristics of Service organizations

7.2.2 Likeness to Service Organizations

The services nature of software service firms is brought out by identifying the distinctive characteristics of service organizations Intangibility of service provides incentives for service operations to make relations with service providers more satisfying to clients Service production requires the provider to extract or solicit the exact nature of the service to provided to the client This calls for being able to handle the client and know his needs Technical competence has to be displayed by the provider to reassure the client Thus one of the points is the need for technical and interpersonal skills on behalf of the provider.

The simultaneous production and consumption of services leads to close interaction between the provider and the client. Thus the client is brought into the production process Thus the client is a co-producer in the process (Bowen, 1990) The close interaction also precludes the presence of a third party which can do the marketing Thus a separate marketing role is diminished. The client will give his business to the

provider only if the provider seems competent. So it is up to the provider himself to prove his competency. Here again arises the feature of technical knowledge as well. Thus we see that the above points are displayed by the software service firms.

7.2.2.1 Technical & Interpersonal skills

- The need for interpersonal skill—the training programs in these firms lay equal emphasis on the improving interpersonal skills among the recruits. There seemed to be a great emphasis on this. Some of the firms prefer to recruit people with better communications skills.
- Techno-social relationship feature—The people sent for marketing or sales, also, have to have development skills. The developers are all expected to have interpersonal skills. This clearly shows that the personal have to be able to manage people and yet have to have technical skills. This point is a feature that is peculiar to service firms (Bowen, 1990).

7.2.2.2 Coproducer role of client in the software services business

The software service firms clearly display the coproducer role of the client in the business.

- Source of requirements—The client has to come to the service provider & give requirements before the development process starts.
- All service firms require the client to sign off each milestone or stage before the developers move on to the next. This involves the client deeply in the production (development process).

7.3 The Product Firms

Here we shall summarize the observations of product firms. These observations are the features that make them distinct from service firms.

The distinctive features that emerge from the study are.

1 **Differentiation.**

- a) The software product firms have more, distinct task assignments than the service firms
- b) Distinction between the marketing sales & support from the development groups All the product firms observed displayed this trait They had a distinctive, separate group that did the sales and marketing of their product Two of the companies also showed a different group independent from the sales team to provide customer support Another, (P1) did the customer support functions, but had no separate dedicated group for it.
- c) The development people were isolated from the involvement with the customers They did only the development tasks
- d) Stable development groups organized around products. Unlike the constant flux in service companies, the development groups showed stability The personnel between groups did not change rapidly There were more or less permanent grouping around the products to be developed This was very much unlike in the service firms, where the developers really did not belong to any group
- e) Differentiation within the development activities

- i) **Differentiation for Requirements Generation:** The product companies show a presence of application domain specialists that are involved in the requirements generation of the products. The job can be compared to a funnel. This person filters all available information from the customers, consultants, developers, monitors competing products, etc. and develops the formal requirements document. Generally, this person is part of the development group.
- ii) **Development personnel:** In product firms, the developers did only development related tasks. They were not involved in the sales or customer support tasks. They did the design, development and documentation.
- iii) **Testing personnel:** All the product companies have separate people to implement the testing functions. They are in a group separated from the development group. Unlike in the service firms, wherein the reviewers/testing is done by people from another project, these people are dedicated for test purposes only.

2 Self Generation of Requirements

- a) The product companies did not need some customer to start their coding efforts. They generated the requirements by themselves. The ability to generate requirements on their own seems to be linked to prior experience & familiarity with the domain of application. Each of the product companies showed a history of business in the application domain, or the origins of the firm in the application domain.

3. Feedback Mechanism

- a) All the product companies showed the existence of a feedback mechanism
The feedback from the customers affected the requirements generation process. None of the companies seem to have really formalized this mechanism Yet all the product companies seemed to be using this mechanism to incrementally improve their products

4 Product Training

- a) The training activities in product firms showed extra training, that was absent in the service firms This is product related training All the firms, showed product related training to be a major component of the training program for the fresh recruits The sales and support staff was also given training when ever new versions of the product appeared. The developers typically gave the training Like the service firms, these firms had technical doamin training for its developers

Chapter 8.

8. Prescriptions, Limitations and Further Work

“A software project is traditionally based on a case-by-case, problem solving approach; the development of strategic capabilities is based instead on experience reuse and organizational sharing . . . Competencies must be built in critical areas of the business by packaging and reusing clusters of experience relevant to the company’s business” -- Basili & Caldiera (1995).

What can we now suggest from our study? Our study establishes the fact that software service firms are basically service organizations. We can improve their management by applying the learning’s from the service literature.

8.1 Prescriptions For Improved Services

From Bowen (1990) & Davidow (1989), we present some of the primary lessons for service management.

Inseparability Realize that service strategy, marketing, operations, quality and human resources management are very tightly interlinked. The quality delivered depends on the quality of personnel. “The process is the service” (Bowen, 1990). The service provider is also the marketer. A marketing or Human Resource Management strategy is also an operations strategy simultaneously. This is one of the most important mind sets to acquire in the improvement of the service business.

Focus The essence of service strategies lies in focus. This point is repeatedly emphasized in the service literature. Focus on the kind of clientele, on the services

provided Davidow (1989) emphasizes to classify the customers, not according to market, but according to the customer service segments. Limiting the clientele to control supply and demand by focusing very sharply on the client types. Focus forces the organization to find ways and means to best serve the chosen segment. It also allows the proper management of the complexities due to the inseparability of the tasks like marketing, operations, etc. Focus will enable satisfying clients better than the competitors due to increased knowledge acquisition about these particular clients.

Manage the Encounter Bowen says that service quality is generated in the encounter between the service provider and the client. The location of the encounter, the “atmospherics” etc. all count in building up the confidence of the client in the service provider. Train the personnel to be aware of this phenomenon and manage the experience that the client undergoes. Since the service given depends on the client’s request for it, the best possible effort must be made to create an environment where the provider is able to elicit what the client really requires.

Manage the Customer’s Expectations The client is the ultimate arbitrator of quality. If he is led to expect a lot from the company and the company fails to deliver, the client goes away with the impression that the company is not worth it. According to Davidow, “lead the customer to expect slightly less than what the company can deliver, yet also deliver better & different from the competitors.” This point also highlights the need to understand the client’s requirements very clearly.

Manage the Service Provider Since the interaction between the service provider and the client is where the business is made or broken, the perceptions of the service provider greatly affect the business. The service provider is a crucial ingredient to

success in the services business. The service nature requires a rapport and good communication to develop between the service provider and the client. The good will felt by the provider invariably is got across to the client. Investing in increasing the competence of the provider only serves to increase client confidence in the firm's capabilities.

Continuous Improvement Bowen (1990) states that services are easily copied. So for continued success, the service firm needs to continuously find ways to deliver better service at a profit to the provider which are different from the competitors. Bowen advises to develop advantages that are not easily copied. Such as developing long-term relations with clients, understanding the client's business so well so as to understand the needs even if he is unable to properly elucidate them etc. Improvement goes hand in hand with the policy of focus.

8.2 Prescriptions for Evolving to Software Products From Software Services

Yoffie (1994) observes the trend in cannibalizing in the IT industry. The current business is cannibalized by the company, by utilizing the later technologies, processes etc. How does one cannibalize a software service business? If we sell them a product instead of a custom built, "from-scratch built" software.

Schware (1992) notes the global trend towards products. He also notes the trend towards verticalization of the market. "The software market has become *ever more specialized by end-user sectors*. This is because each sector has its own characteristics in terms of data processing expenditures, environment, level of information's intensity, and importance of vertical applications." (Schware, 1992, italics ours)

The above observation is the key to an evolution based strategy towards products for the currently successful service firms. Effective service management demands focus. The observation above directs us to the kind of focus we should adopt: *Towards end-user segments*. Focus will point the firm in the right direction, but a policy of continual improvement and organizational learning will be needed to achieve the aims. The suggestion we propose is to evolve into a product's company by gradual acquisition of knowledge and reuse.

Over time learn the intricacies of the chosen segment, understand the segment, its clients, it's business needs etc. Specialize people in terms of the end-user or application domains. So that they acquire the knowledge of the sector. Through a continual process of knowledge acquisition, the firm can have evolved ways to meet the demands of the sector more efficiently, speedily and cheaper. While the firm acquires domain level knowledge, it should also acquire the competencies in product development. Ultimately, within the space of a few years, the firm should have evolved sufficiently in both dimensions to be able to develop its own products. It should also have developed a market or "mind share" in the clients of that sector that should help to replace or cannibalize its service business by the product. The process is slightly elaborated below

8.3 The Product Development Dimension

“ Individual products are the offspring of product platforms that are enhanced over time. Product families and their successive platforms are themselves the applied result of a firm’s underlying core capabilities. In well-managed firms, such core capabilities tend to be of much longer duration and broader scope than single product families or individual products. The authors recommend a longer run focus on enhancing core capabilities, which includes identifying what they are and how they are applied and synthesized in new products” -- Meyer & Utterback (1993)

Our findings about the product companies imply that the following are some of the core competencies to be acquired for the successful development of products. We call them core competencies, because these competencies, once acquired can be leveraged across several products or product lines. A way to acquire them is to develop people by repeating the same tasks across several projects. By giving these people training to improve their performance in their allocated tasks. Over time, they should be expected to bring in improvements that they can impart to their fresher (younger?) colleagues.

Requirements Generation. Being able to generate proper requirements is crucial to the software products business. From our findings, it appears that domain experience is the crux to generating the initial requirements. That would be the reason why all the product companies seemed to need domain specialists. They gather the information and then have to produce them in a form that is taken as the specifications for the developers.

Just generating the requirements once is not sufficient. The requirements change with time and increasing user sophistication. Thus a feedback mechanism also is a must that allows the requirements to be updated based on customer feedback. This insures that the product gives what the customers really need.

Thus by repetitively doing projects in the same domain, specific people can acquire the understanding of the domain and translate them into suitable requirements. *The projects that the firm does can serve as the feedback process* by which the requirements and domain knowledge can be increased.

Testing Product testing by a dedicated, specialized, independent group has been a common trait of the product firms seen. This is another critical necessity. This group is to ensure the quality control of the final product. All the product companies have portrayed a specialized testing group that is stable and devoted to testing only. Our findings seem to imply that expertise in testing is a necessity for product companies.

By establishing a stable testing team, that tests the software for each project, we can use each project as means of improving our testing techniques for the particular domain. And through suitable generalizations, we can evolve generalized testing knowledge.

Customer support services. These people have to deal with the customers. They will be involved in installing the software, providing user training, answering queries, solving difficulties etc. These people also happen to be the *source through which the feedback* gets channeled into the development group. Thus the customer support people must be supported with systems that allow them to record complaints,

suggestions etc that then are available for the requirements, development and testing people.

By specifically setting aside particular people to do customer installations of the project software, we can develop the rudiments of support skills.

There is another trait that *we think* should have been in this list is **Documentation**. A software product is not just the software itself, but also the documentation that goes with it that describes how it works, how to use it, etc This documentation could be in the form of on-line help or through the hard-copy manuals We noticed only one company in our study that had a dedicated group for documentation

We should set aside the documentation task to be done by the same set of people across projects. This will help in evolving standards of documentation and also develop skills in proper documentation

All these are acquirable over a due course of time. The change from services to products cannot be sudden We propose that it is possible by following the service concepts to *evolve* into a products based company Central to the scheme is a continual improvement and learning orientation Individual projects are used to achieve organizational learning (See Basili and Calidera, 1995, who use the philosophy to improve the software quality, and a good method to go about it) We do not give solutions for marketing the product Though as we stated above, the goal is to offer the customer this product instead of offering to custom-build the software for him The idea is to cannibalize the current service business by offering a product that is cheaper, more reliable and quicker to go into operation. The product replaces the service

How to achieve focus. we propose that the service companies should first focus their business according to the application domains “A domain defines a common problem space whose solutions share design decisions It often represents an industrial area, such as telecommunications, medicine, defense, process control, and so on ” (Olsen, 1994)

This can be done by limiting kind of projects taken by the company to those in the desired domain That is the company develops an expertise in consistently doing projects of that kind Each project serves to increase the knowledge base of the company By storing and analyzing it's project experiences it can add to the organizational and individual learning It thus builds a manpower base that is familiar with the domain and its solutions. In time, the company will have acquired enough requirements to analyze and identify the sections that are invariant over clients These are then the pieces that can be replaced by reusable code The company could also adapt tools that speed up the development in this particular domain. In time, the company will have sufficient knowledge base to convert it's reuse efforts into a complete product It can market this product to its prospective service customers. The clients must be convinced that the product will serve their needs faster (no development time from scratch), higher quality & more reliable (reused code would have already undergone so many tests), and cheaper

This way, the company does not lose out on its current service business. Yet it is engaged in a learning process that helps it to acquire the required

competencies for full fledged products. The services business is used as the feedback process observed in the product companies to incrementally improve our understanding of the domain and develop our competencies (See Macala et al , 1996 . They explain how to manage domain specific product development They describe their organization to carry this out.)

While the above process is going on, the company should have set in place systems to acquire the above mentioned core competencies It should hire domain experts to become part of the project staff, allocate people so that they can specialize in testing, e g let people specialize in onsite installation so that later on they can be full fledged customer support personnel Instead of having the project team members do all the tasks, let these specialists handle the tasks that they develop expertise in Let there arise experts in documentation, testing, requirements, support service etc Let these figure out how to do their tasks better.

This will also require a change in the training patterns for the fresh recruits or for those allocated to this kind of a setup. These people will have to be trained in the tools that the project is using for its industry and also training on the reused components and how to use them

8.4 Limitations Of the Study

The methodology of the study . The data has been collected by interviewing people, discussions with them, reports of discussions etc. Their interpretations and biases affects the data provided by them. Occasionally, it was felt that the subject was attempting to say what the investigator would have liked to hear, and not what was

factual. It has not been possible to interview every corresponding person across the companies. This industry shows a lot of mobility and sometimes the ideal candidate was unavailable. In some cases, there have been gaps in some information available from one company. Thus some observations have not been presented due to lack of corresponding data from the other similar companies. It has not been possible to validate information given by one person through questioning the colleagues on the same points. The colleagues demurred from even casually commenting on topics that they thought they are not competent to answer. Since only one investigator was involved, not all the information discussed was recorded.

The type of organizations studied All the service type organizations studied are export oriented. It would have greatly improved the robustness of the generalizations if we could have got domestic service providers as well. A large number of foreign companies are setting up their software businesses here. Most of the companies studied here are Indian companies. One of the companies studied which has a component of foreign ownership showed some differences in organization in comparison with the Indian owned enterprises. It would seem possible that the influence of the foreign ownership could affect the organizations in such companies. Thus the generalization of the observations here are poorer for unavailability of that kind of data.

The scope of the study The study does not look in detail into the functioning of the other departments like finance, administration etc. So differences in these departments cannot be commented upon. **Limitations** of time on the part of the subjects & investigator prevented lengthy in depth discussions. There are some topics which have not been covered in sufficient depth due to these restrictions.

8.5 Strengths of the Study

Our confidence in our findings are improved by some literature that we came across very late in to the thesis. Some of the confidence emerges from the data set we encountered.

The spread of the cases. We have been very fortunate in having an equal spread of compose for each type and even more to have one sample that is involved in both—service and products. The clear distinctions in the internal operations for the 2 kind of outputs of the company adds strength to the generalization. The product companies are into different segments and yet show common traits. The sizes of the companies vary but the common traits are well exhibited by all. Another fact that lends to the robustness of the study is that all the companies studied are in different cities in India. Local effects are thus discounted.

External support for the findings. We have an unexpected support of our findings in a recent released book. This could even be taken as another case study for our research, done by an independent author.

Product findings. The findings of Michael Cusumano (1996) in his very recently released book “Microsoft Secrets”, support our findings for the product companies. He finds Microsoft to have a 1:1 ratio of developers to testers. The testers are an independent lot from the developers. The requirement’s generation function has a separate group allocated to it. And Microsoft has institutionalized a feedback process from its vast customer support divisions. The feature of product training is carried out by the group called “User education” that also does the documentation for the products. The corporate organization of Microsoft is based

around product lines and products Microsoft follows Yoffie's observations that the managers should be technically competent. Most of their product managers have risen from the developmental groups or have had considerable experience elsewhere. From the support of the findings of this book, and our findings, it becomes very clear that competencies in testing, requirements generation and feedback channels are a must for product development.

8.6 Future Work and Extensions

Effect of ownership on the structure of the companies The discrepancy of the corporate structure of one of the companies raises the point of the effect of the ownership on the organization of software companies. Since a number of foreign companies are opening Indian operations for software, it seems to be pertinent to see what differences exist in the Human Resource Management practices and structures in the Indian owned and foreign owned firms

Software engineering models & the organization · Almost all the companies studied seemed to be following the waterfall model of software engineering. One of the product companies was planning to go into object reuse in a big way During discussions with the manager of this initiative, he mentioned that with object reuse, the whole development process and organization will change. If they carry out the reuse to the extent he foresees, then he expected to hire only domain experts or MBA's in the domain to patch together the final application program from the set of reusable components According to the manager, the sizes of the application development teams could be drastically reduced The effort of development would instead be focused on the development of the reusable components Given that object reuse is expected to

become an accepted way of software development, it seems pertinent to ask how will the management practices and organization have to change to accommodate this change in the technology of the organization. In short, research in detail the relation of technology and the software organization. How will an organization look if it uses other models like the spiral or Rapid Application Development?

Learning paradigms and software organizations During the study, one of the most striking feature noticeable across the industry seems the heavy amounts of training continuously going on. Keeping up with the technology is a strategic necessity for organization and individual alike. Given the fact that the technology of the machines, the software technology change rapidly in this business and customer's expectations also change, adopting a learning organization seems to be an answer to constant need to update knowledge. Modeling a software organization as a knowledge intensive firm (Starbuck, 1992) seems to be an alternative to a service model. Our suggestions for an evolutionary approach to products relies heavily on organizational learning. It seems to be logical to pursue this stream of research next to find how to reorganize a service firm for maximum speedy effective learning.

Quality Systems and the Organization: Quality systems and software development are very closely linked. The effect of ISO certification on the software firms organizations needs to be explored. It may have led to a bureaucratization of software development. And it could be the reason for a finding similar organizations in the service firms. Following the Capability Maturity Model (CMM) model of the Software Engg. Institute, Carnegie-Mellon University, eventually leads to a learning organization. The Software Engg. Laboratory of NASA proposes a model based on continuous improvement. This model too seems to advocate moving towards a learning based

organization. Thus, it is the quality systems that demand organizational changes. The link between these needs to be better explored.

We briefly recapitulate Yoffie's observations about the IT industry. He mentions 5 characteristics:

- Global nature
- Blurring boundaries
- Alliances
- The Phenomenon of Lock-in & Lock-out . 1st mover advantages, breaking new grounds, cannibalizing your own business
- Need for technically literate managers

In view of the above points we have the following observations:

- The Indian software service companies are managed by technically competent managers
- In the world software market, we certainly have some 1st mover advantages for our software capabilities. These should be exploited to keep ahead of our other competitors. From a services viewpoint, we have a track record that generates trust in the clients.
- Some companies such as S1 are going in for long term alliances with their clients. They thus have locked-in their clients and are in a position to deeply understand the workings of the client, and have little effort to make in establishing rapport with the clients.

Our software companies have made their success in the services segments. If we believe in Yoffie, that cannibalization of the current business is a necessity in the IT industry, then it is about time that our companies found out ways to cannibalize the business from the way it currently is done. Before some other country does for us.

9. Appendix

9.1 Appendix 1

On the Strategic Management of Information Technology

This appendix carries excerpts from Yoffie. In particular the explanation of the major themes common to the IT industry. The software industry is a subset of the IT industry and thus these themes recur in dealings with the software industry

Yoffie identifies the major themes that cut across the IT industry. Some excerpts follow. These help us gain an insight into the working of this high tech industry

- 1 Global geographic scope. Yoffie terms this as the most obvious feature shared by all infotech industries. All the industries share a common set of customer requirements that behooves any competitor to expand beyond their own territory. Also, in some industries like semiconductors and telecom, R&D costs and scale economies make it an absolute necessity.
- 2 Blurring industry boundaries - *"technology has blurred the boundaries between the industries and across industry segments"* (His italics). Earlier the giants like IBM, DEC & other vertically integrated firms dominated the industry. The competition was across all segments. In the 1990s, however, these are disintegrating while, independent vendors like Intel in hardware,

Microsoft in software, and Compaq, Dell, & Apple in personal computers are vying for market share within their horizontal. This blurring of industries is apparent in the way the telcom and the content software companies have been merging. This is expected to continue well towards the end of the decade, only get more intertwined.

- 3 Blurring firm boundaries - The blurring of industry boundaries has been accompanied by a blurring of firm boundaries. Alliances are everywhere, particularly across national borders (e.g. Apple Inc. And Toshiba/Sharp for their Newton Pad). The motivations have ranged from alliances with the govt; alliances on 'pre-competitive' technologies within an industry; risk sharing alliances among firms. Examples are the PowerPC combine, the OSF (Open Software Foundation, a consortium of UNIX companies), etc.
- 4 Lock-in & lock out effects - High technology industries suffer from or benefit from "lock-in" & "lock-out" effects. Lock-in effects means that once firms make a commitment down a particular path, it becomes increasingly difficult to change direction. For both suppliers of technology and consumers of products, infotech exhibits extraordinary switching costs. The obvious reason. IT tends to have broad applications within a customer's business. The same scenario emerges in the PC market. Both Microsoft and Intel have locked-in the majority of computer users because, so much time, money and energy have been spent on buying X86-based hardware, training corporate personnel on DOS-Windows software. Few customers are eager to switch. Locked-out would occur if a firm is not part

of a standard, it is excluded from participating in the growth and profits available to the Intel's' and Microsoft's' who lockin their customers.

There are several critical implications of lock-in and lock-out effects. The most important is the rule of first mover advantages. The 1st to establish a standard, the 1st to move down steep learning curves, the first to build economies of scale in segments where lockin effects exist usually reap the lion's share of the profits. Though is no guarantee of success. And first mover does not necessarily mean being the very first to market. Though Apple created the market for standalone PCs'', it was IBM, 5 years later that recognized its potential and created the standard. It seems creating a standard is to get as many to support your invention as possible. Like SUN's Java.

The 2nd implication of lock-in and lockout is recognizing that breaking new ground in an industry like IT requires a return to the old adage *try, try and try again*. Because of lockin, any change is difficult to engineer. Companies willing to make big bets on innovation can make it happen. E.g. Microsoft failed repeatedly to introduce its Windows GUI, before it succeeded, spectacularly.

The 3rd implication of lock-in & lock-out, is the willingness to *cannibalize your business*. Perhaps the most difficult strategic move for any firm in any industry is to offer product or services, which reduce the sales of existing product lines. The history of IT provides very clear lessons on this point. If you have the capability to cannibalize your own product lines, and choose not to, someone else surely will. The danger of refusing to cannibalize your own sales is that when new products or technologies emerge as substitutes, *they get locked in, and you get locked-out*. The strategic

question of cannibalization is not one of 'if', it is only a question of when. Whenever technology makes it possible, other firms always find a way to utilize it

- 1 Mastering technology - The fifth theme is that managing IT businesses defies some of the standard wisdom of general management. Just being a good general manager may not be enough for IT firms; excellent managers in IT firms are invariably those who can *master technology*. The resource allocation requires an in-depth understanding of technological trade-off. As a consequence, financially-driven or marketing-oriented general managers, without a strong understanding of the technological frontier, usually have severe problems in trying to steer the course of an infotech business. The most celebrated example of this is John Sculley, of Apple. He joined from Pepsi, with a reputation of good operating skills and marketing savvy. Repeatedly Sculley found that he could not push Apple in the directions he believed to be the future, he was besieged by engineers with all of the technological problems. It was not until Sculley appointed himself Chief Technological Officer and committed himself to learning the technology that he was in a position to steer the company as a leader and general manager should. Microsoft's Bill Gates, effectiveness as a leader and a manager stemmed from his ability to allocate effectively corporate resources and his own time to highly valued projects that had the highest potential payoffs. Although IBM spent more on R&D than most of the computer industry *combined*, many of their problems in the late 1980s' and early '90s' stemmed from their difficulty in turning R&D dollars into hit products.

There are few industries which match the rapid pace of change and the numerous risks and opportunities offered by the new information technologies. Similarly, there are few industries that require such constant renewal and organizational transformation.

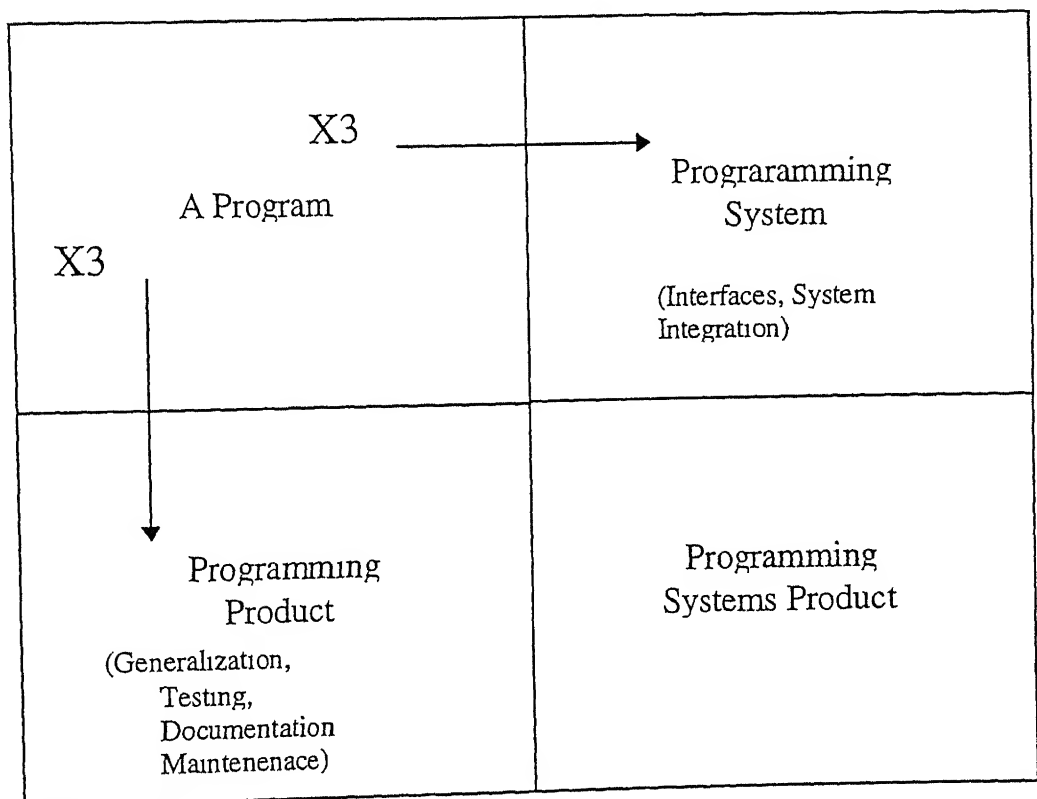
9.2 Appendix 2

9.2.1 What is different about software

This appendix has 3 parts to it. The first part excerpts Brooks (Brooks, 1975) statements (with some extra material by me) on what is programming all about. The other part is part of a debate over the USENET, in the comp software-eng newsgroup on the nature of software. The third part details some notes about software engineering

9.2.2 The Craft, its Woes and its Joys.

What is being produced by either large industrial programming teams or garage duos? Brooks categorizes software efforts into 4 types He explains with a diagram (See Figure 9-1) The 4 categories are a program, a programming product, a programming system and the programming systems product Each type involves different levels of



effort and associated cost

A program, on the upper left quadrant of the diagram, is complete in itself. It is ready to be run by the author on the system on which it was developed. This is most commonly exemplified by the class assignments that students do or the internally developed & used programs of a department. There are two ways a program can be converted into a more useful, but more costly, object. These 2 ways are represented by the boundaries in the diagram.

Moving down across the horizontal boundary, a program becomes a *programming product*. This is a program that can be run, tested, repaired, and extended by anybody. It is usable in many operating environments, for many sets of data. To become a generally useable programming product, a program must be written in a generalized fashion. In particular, the range and form of inputs must be generalized as much as the basic algorithm will reasonably allow. Then the program must be thoroughly tested, so that it can be depended upon. This means that a substantial bank of test cases, exploring the input range and probing its boundaries, must be prepared, run and recorded. Finally, promotion of a program to a programming product requires its thorough documentation, so that anyone may use it, fix it, and extend it. As a rule of thumb, he estimates that a programming product costs at least three times as much as a debugged program with the same function. An example would be Wordstar, or Lotus 123, when they first came out. They never became available on other systems, but had documentation, were tested, etc. A fine example are the GNU products like gcc—a compiler, perl etc. that are well documented, run across various platforms. Being public domain, it is extended, fixed by many people across the world,

everyday. These kinds of systems are the children of the Internet. Any extensions made, that are found to be useful are incorporated into the next version. No matter who made it.

Moving across the vertical boundary, a program becomes a component in a *programming system*. This is a collection of interacting programs, coordinated in function and disciplined in format, so that the assemblage constitutes an entire facility for large tasks. To become a programming system component, a program must be written so that every input and output conforms in syntax and semantics with precisely defined interfaces. The program must also be designed that it uses only a prescribed budget of resources—memory space, IO devices, computer time. Finally, the program must be tested with other system components in all expected combinations. This testing must be extensive, for the number of cases grows in a combinatorial fashion. It is time-consuming, for subtle bugs arise from unexpected interactions of debugged components. A programming system component costs at least 3 times as much as a stand alone program of the same function. The cost may be greater if the system has many components. This can be exemplified by the office suite of programs that are available e.g. MS Office, SmartSuite which has Lotus 123 type spreadsheet as just one component of the suite of programs like a database manager, a wordprocessor, etc. The data developed with one of these components is effortlessly incorporated as data of the other component.

In the lower right hand corner of the figure, stand the *programming systems product*. This differs from the simple program in all the above ways. It is generalized, it undergoes testing, has documentation, is maintainable, is integrated or intergrateable.

through its well-defined interfaces. It costs 9 times as much. But is the truly useful object, the intended product of most system programming efforts.

After explaining what is it that is made, in rather poetic fashion, Brooks goes on to explain why programming is fun. Later, he goes on to explain why its so much headache.

- 1 For the sheer joy making things Especially things of own design.
2. For the pleasure of making things that are useful “Deep within, we want others to use our work and to find it helpful ”
- 3 Third is the fascination of fashioning complex objects of interlocking moving parts, and watching them work in subtle cycle, playing out the consequences of principles built in from the beginning
- 4 The joy of always learning, which springs from the non repeating nature of the task In one way the problem is ever new, and its solver learns something. sometimes practical, sometimes theoretical, and sometimes both.
- 5 There is the delight of working in such a tractable medium The programmer, like the poet, works only slightly removed from pure thought-stuff. He builds his castles in the air, from air, creating by exertion of the imagination. Few media of creation are so flexible, so easy to polish and rework, so readily capable of realizing grand conceptual structures This tractability has its own problems. Yet the program, unlike the poet’s words, is real in the sense that it moves and works machines, controls airplanes, satellites, transfers money between banks etc.

His explanation highlights the non repeatable nature of the task, and the tractability of the medium. He then explains what makes software such a headache.

- 1 One must perform perfectly. Human beings are not accustomed to being perfect, and few areas of human activity demand it.
- 2 Other people set one's objectives, provide one's resources, and furnish one's information. One rarely controls the circumstance of his work, or even its goal. In management terms, one's authority is not sufficient for his responsibility. The programmer depends upon other people's programs. These are often maldesigned, poorly implemented, incompletely delivered and poorly documented. So he must spend hours studying and fixing things that in an ideal world would be complete, available and usable.
- 3 Designing grand concepts is fun, finding nitty little bugs is just work. One finds that debugging has a linear convergence, or worse, where one somehow expects a quadratic sort of approach to the end. So design drags on and on, the last difficult bugs taking more time to find than the first.
- 4 The last straw is that the product over which one has labored so long appears to be obsolete upon (or before) completion. Already colleagues and competitors are in hot pursuit of new and better ideas. Already the displacement of one's thought child is not only conceived, but scheduled. Of course, the technological base on which one builds is *always* advancing. As soon as one freezes a design it becomes obsolete in terms of its concepts. But implementation of real products demands phasing and quantizing. The obsolescence of an implementation must be measured against other existing

implementations, not against unrealized concepts. The challenge and the mission are to find real solutions to real problems on actual schedules with available resources

9.2.3 USENET Debate

These excerpts from a USENET debate on the difference of software is included to give an idea of the issues involved, the differences and some of the thoughts of practicing software engineers. Most of the important information from the headers is given for completeness. Any or the complete debate can be retrieved by searching with the subject header from any of USENET archives like Dejanews, Yahoo or Altavista on the world wide web

Subject: Re: What's different about software?

1 **From:** patrick_d_logan@ccm.jf.intel.com (Patrick D Logan)

Newsgroups: comp.software-eng

Date: Tue, 22 Nov 1994 15:33:03

Organization: Intel / ProShare

Dijkstra (sp?) apologies made this analogy many years ago.

(Paraphrasing)

The electronics designers essentially take the same design and apply different technologies to it over and over. The software designers essentially take the same technology and apply it to different designs over and over.

(End)

Now that is an oversimplification, but a very useful one to begin to understand the fundamental differences between software development and other engineering disciplines.

Patrick_D_Logan@ccm.jf.intel.com

Intel ProShare Teleconferencing

(503) 264-9309 FAX (503) 263-3375

2. **From:** tkarp@pipeline.com (Tony Karp)

Date: 24 Nov 1994 17:01:04 -0500

Organization: TLC Systems Corp

It can only be fixed by the manufacturer. This is truer for software than for most other products.

If your TV or VCR or car breaks, you can probably get it fixed locally.

Not so with software. If MS Word is broken, only Microsoft can fix it.

Software doesn't wear out—it becomes obsolete.

Tony Karp, TLC Systems Corp, NYC — tkarp@pipeline.com

3 **From:** griffind@sunny.dab.ge.com (David W Griffin)

Date: 28 Nov 1994 12:25:19 GMT

Organization: Martin Marietta - SAS

Software is easiest to change, but not easiest to change correctly. Ask the electrical engineer how he would like to build a computer motherboard given that he has to fabricate all his own components by hand using his own silicon foundry and only the minimum automation. Ask him how he'd like to build his own chips, even his own resistors and boards. Ask him how he'd like to formulate his own

solder That's what we have to do all the time There are no available, accessible, reliable catalogs of software components for the average software developer
As for tools, at the EE has his oscilloscopes and meters and analysis tools What does a software developer have? Usually just a compiler, linker, and if he's extremely lucky, a debugger (and if he's *really* lucky it might be a source level debugger)

David W Griffin | Martin Marietta Corp
griffind@escmail.orl.mmc.com | Orlando, Florida
(407)826-3697 | Posts are my opinions only

4 **From:** tkarp@pipeline.com (Tony Karp)
Date 28 Nov 1994 18:29:58 -0500
Organization TLC Systems Corp
Lines 24

Another way that software is different from
Software is more subject to catastrophic failure than most other things While other things may fail catastrophically, it is far more common in software
There are many ways that software is different I think that it is important to try and recognize these differences and gain some understanding from them
It's about understanding what we do
The real question is what would you do if your car misbehaved as often as your computer?
Tony Karp, TLC Systems Corp, NYC — tkarp@pipeline.com

5 **From:** serviss@tazdevil.cig.mot.com (Gerald Serviss)
Date 29 Nov 1994 00:05:54 GMT
Organization Cellular Infrastructure Group, Motorola
Lines 65

Software development as a job description is at best 50 years old Considering that electrical engineering is perhaps 100 years old, we are young and very young compared to say bridge building.
Yes, this is true but we would be strained to be like say an auto maker offering tons of options and colors on those million shipped units The software that you are taking about is relatively simple as compared to the most complex stuff (telephony systems, air traffic control etc)

The issue that is being missed here is that the large software projects that are undertaken today are the most complex 'machines' ever built by humankind Would you have felt safe with your code orbiting the planet and controlling weapons of mass destruction? I don't think that I would have

--
Democracy is where you can say what you think even | Jerry Serviss
if you don't think | Motorola Inc
| serviss@cig.mot.com

6 **From:** roger_m1@hnlv4.verifone.com
Date: Tue, 29 Nov 94 03:49:44 GMT
Distribution world
Organization VeriFone Inc
Lines 44

Guy A Lyle writes

>

>Please consider the relative youthfulness of the software engineering
>"profession" compared to that of electrical or mechanical engineering
>We are "not very good" because our branch of engineering has yet to
>establish reliable, repeatable processes.

Which, in turn, is because we don't yet have mature technology By technology I don't mean tools and design methods, I mean an established body of knowledge about the right way to build things. Given the need to design a veebleflexor, most engineers can go to handbooks, etc and find out how veebleflexors are built He will choose among various well-understood alternatives for the veebleflexor

subsystems And he will probably add a little bit of creative innovation to make this one just right for his particular customer

But a software engineer designing, oh let's say, an airport baggage handling system, typically starts out with a blank sheet of paper and the hope that the lack of solid application knowledge can be compensated for by pure methodology I view the CMM as basically an attempt to force the outward trappings of a mature process onto an immature technology This may not be a bad thing to do while waiting for the technology to evolve, but I am very skeptical that truly fundamental improvement will come from this path

As an exception which proves the rule consider compiler design Here there is a well-established body of theory and practice, and in my experience compiler projects generally go pretty smoothly and produce relatively trouble-free products compared to other software of comparable size and complexity. As far back as "The Mythical Man-Month" Fred Brooks observed that "The flaws in design and execution pervade especially the control programs, as distinguished from the language compilers" Also, "Some of the compiler teams in the OS/360 effort were building their third or fourth systems, and the excellence of their products shows it"

Roger Miller VeriFone, Inc roger_ml@verifone.com

7 From: tej@world.std.com (Thomas E Janzen)

Summary There will never be a "s/w design made easy" video

Keywords software, design

Organization The World Public Access UNIX, Brookline, MA

Date Wed, 30 Nov 1994 01:43:25 GMT

Lines 27

There will never be a textbook on building software systems for baggage handling systems I would be surprised to find a textbook on building baggage handling hardware Software is being applied to so many new and innovative applications every day that the variety of applications is indefinitely large Principles can be discovered and invented, thus real-time studies, compiler technology, numerical analysis But the increasing variety will continue to grow

This is why it is important to have domain experts and software experts who can communicate during requirements analysis Domain experts are the worst coders in the world (unless the domain is CASE, or even then) But they are needed to define products

And yet, scientific companies who need first- or second-rate s/w engineers hire 2nd-rate scientists (4th-rate s/w developers) to write software in the belief that scientific knowledge is more important than s/w knowledge when writing real-time code

A complete requirements analysis embodies the domain knowledge required for the project (but of course training in the domain helps the developers)

Denver of course had management problems and last-minute changes from a Johnny-come-lately but key customer

The Therac-25 had a h/w problem they removed the h/w interlocks

—

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8 From: John_R_Goold@magic.ca (John R Goold)

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In <CzMI8E.GEA@harlequin.co.uk> daveb@harlqn.co.uk (Dave Berry) writes

>>

>Larry Dick writes

>It seems to me that when multiple disciplines interact with software,

>then decisions are made (sometimes on the fly) that force software to

>pick up the pieces for hardware problems Even at system design, trade

>offs are made that add to the detail and complexity of software.

>

>When was the last time a hardware designer offered to add a few IC's to

>the board to mitigate a software problem unless the software was shown

>to be unable to perform without added hardware?

>

>Yet, this is how it should be, software is the easiest environment to

>make a change in. It is usually easier to modify software than hardware

>(mechanical or electrical). It is usually easier to develop control

>logic in software than in hardware, etc. And finally, it is usually

>easier to ship software than hardware.

>But, the cost of all of this is that the software becomes more and more complex while at the same time the hardware environment is stripped of all the complexity that can be reasonably disposed of. I agree, in essence, with what you say, but it is a mistake to make this a rule of thumb (i.e. don't change the hardware, change the software). Anyone disagreeing should read the report on the Therac-25

9.3 Appendix 3

This appendix is a secondary reading for the chapter 3 This gives detailed information on the definitions of services and issues within services management. Following the services note are notes on the software product concept

9.3.1 On Services as opposed to Goods/Products

This definition and the issues etc Related to services is excerpted from Bowen et al (Bowen et al, 1990)

A service can be viewed as “a contract under which one or more persons (principals) engage another person (the agent) to perform some service on their behalf which involves delegating some decision making authority to the agent” Marx wrote “*Services are consumed the moment that they are produced*” The useful effect can be consumed only during the process of production It does not exist as a utility different from the process, a use-thing which does not function as an article of commerce, *does not circulate as a commodity after it has been produced*” (Italics mine) Bell (Bell, 1973) describes work in an industrial society as primarily a “game against fabricated nature” In contrast, he describe work in the postindustrial services-dominated world as primarily a “game between persons”.

The commonly agreed upon attributes of services are as follows (Bowen et al, 1990):

- 1 Services are *intangible* Services are experiences that are rendered, while products are objects that are possessed Intangibility makes it difficult for management, employees, and customers to assess service output and service quality.

2. Services tend to be *consumed and produced simultaneously*. This simultaneity complicates the process of managing the supply of & demand for services. The customer-contact personnel carry out management, operations and marketing functions as they do their jobs. Particularly in labor intensive services, quality is created during the service encounter between service provider and customer.
3. *Customer Participation* customers tend to participate in the production and delivery of the services as they consume. Customers provide the information that is the raw material to be transformed to service output. Services also depend on making use of the clients efforts in the transformation process.

Though the above attributes (intangibility, simultaneity of consumption & production, & customer participation), are taken as the general features of services; there is no strong consensus regarding the precise distinctions of services & goods. Clear delineation is difficult, if not impossible, given that output of goods is typically accompanied by a facilitating service and service output is sometimes accompanied by a facilitating good. But clear delineation is not the goal. The purpose of specifying attributes of services is to offer a conceptual map for locating where good and services differ.

9.3.2 Issues in service management

Services have unique strategic issues. This is because of their intangibility. Customers must commit to purchasing before service production, and the services themselves are to a large extent ephemeral, making the evaluation process primarily subjective and customer dependent. Because of the intimate relationship between perception, evaluation and the experience, the roles of production and marketing are inextricably

intertwined for employees just as human resource management and internal marketing are for supervisors. The service outputs are difficult to separate into units, so measurement too is difficult, adding to the already intertwined, fuzzy production process.

Given the intangible nature of service, & its production process, there is little assurance that the quality of the service will be the same from time to time. The end result needs to be a service production process that is consistent over time, place, employee, customer service product. Intangibility means that clients often have few objective reference points to use in perceiving the value of the service they consume. Relevant cues are ambiguous, and client perceptions are highly subject to social influences. Thus there is incentive for the service operations to make relations with service providers more satisfying to the clients, e.g., the friendliness of the bank teller or the telephone operator is an important factor in customer satisfaction. 'Climate' is evidenced not only by employees' actions but by other, more physical factors. Such as furniture arrangement, use of space, physical appearance of servers (& customers!) impinge on the server-customer relationship. All this is part of the 'atmospherics' of the service encounter that clients use to evaluate the service. Since the service is intangible, these more physical and perceivable factors take importance.

Simultaneity of production & consumption leads to the game between persons. It is when the customer orders, that the production begins, and also the consumption. This implies that the producer and the customer must interact for the delivery of the service to be complete. In some senses, the producers are mini-factories unto themselves, because they not only produce the output but also sell it. This complicates things. The

customer has to be brought into the production process. And the customer is not a controllable entity like iron and brings in an uncertainty into the production process that cannot be organizationally isolated. Couple to this the fact that the customer is uncertain of the quality of the service provider. The customer looks for signs of competency in the provider, the provider seeks to control the customer's reactivity.

The customer is ego-involved in the process, since it is they or their personal property that that constitutes the raw material transformed, and yet another reason for their apprehensions. Thus the provider has to provide the rationale or explanation for the actions actually take by the service provider. This is a form of technical justification that is undertaken solely by the service provider. Technical justification is a bonding mechanism to assure customers of the service provider's competence under conditions of uncertainty. This is causal information for a decision and is also instrumental in clients' receptivity to the service being rendered. The more reactivity expected from the client, the more technological justification can be correspondingly expected of the service provider.

It is the customers' involvement in service operations that generates the notion of "technical" relationships—a series of indispensable changes in the technology. This is a segment of service technology that is embodied in the social interaction between service providers and clients. Within such interactions, information is generated, converted, and exchanged in the process of rendering the service to clients. The task activities necessary to convert the information in the transaction will depend largely on the kinds of relationships that exist between provider and customer-client.

Consequently, the technology of the service becomes inseparable from the social relationship between provider and customer.

Thus the high customer contact employee, is involved in a three-way interaction between themselves, customers, and the production process or technology. The workers in jobs, dealing with only materials or things and not with people are required to be technically proficient only. The high contact worker must manage the customer-technology interaction. He must also simultaneously interact directly with customers. These 2 additional interactions lie at the heart of the game between persons, posited by Bell. Thus the cohesion between servers and customers can influence the productivity of the service organization. It is important to present to the customer, employees who are perceived as competent. This perceived competence will serve to increase the employee's credibility with the customers and will lead to an improved flow of information between the employee and the customer. This then will facilitate the production of the service.

The key raw material for the service production is information which must usually be obtained from the customer. Clearly, interpersonal skills are important here as they relate to the communications process involved in obtaining this. Thus for optimal job performance neither technical skills nor interpersonal skills alone, are sufficient. For example, we expect airline flight attendants to be technically competent concerning the safety and passenger service aspects of their jobs, but we also expect them to be interpersonally pleasant, and attractive, as they instruct/train passengers in the use of safety equipment and provide in-flight service.

9.3.3 Gunther's Assumptions for Software Products

A software product is a computer program plus all of the planning, documentation, testing, publications, training, distribution, maintenance, and control that comprise the aggregate software product—software to be installed at more than one site, for use by people not known by the developers, in ways not anticipated by the developers.

The assumptions Gunther maintains for software products are -

- 1 The developer is unacquainted with the user.
- 2 User requirements either are developed by the developer or are presented to him by an intermediary, such as a marketing support organization.
- 3 Users do not participate in design reviews, except possibly when represented by an intermediary
- 4 The software must be run on a wide range of hardware configurations, in a wide range of software environments.
- 5 Users install the software themselves or have someone other than the developer do it for them.
6. Problems are resolved by correspondence, sometimes through an intermediary.

These assumptions, he states are different from those commonly mentioned in books that are meant for programs, or software systems. These other assumptions, that operate in these cases are as follows

1. The developer is the user or is at least organizationally related to the user

- 2 The user specifies his requirements directly to the developer.
- 3 The user participates in design reviews.
- 4 The software must run on only one or limited range of hardware configurations.
5. The developer installs the software for the user
- 6 Problems in using the software are resolved by direct interaction between the user and the developer/maintainer

A software products organization is markedly different from an open programming shop, where virtually all of the resources are concentrated in the development unit and are assigned on a rotational basis to client programming projects.

Appendix 4

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